

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL (I.C. ENGINE & AUTOMOBILE ENGINEERING) (11)

### ALTERNATE FUELS AND ENERGY

Subject Code: 3711110

SEMESTER: I

**Type of course:** Advanced

**Prerequisite:** - None

**Rationale:** To educate the students about the use of alternate fuel in I.C engines to know the use of such fuels and its role in combustion, performance and emissions in I.C engines. This course is imparting knowledge on energy storage and its utilization in modern vehicles.

#### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

#### Content:

Sr. No.	Content	Total Hrs	% Weightage
1.	<b>Unit 1: Conventional fuels;</b> Estimation of conventional fuels; advantages and disadvantages of conventional fuels; Need for Alternate fuel; Availability and Comparative properties of Alternate fuels; Use of Alcohols; LPG, Hydrogen; CNG and LNG; Vegetable oils and Biogas in Automotive Engines; Relative merits and demerits of various alternate fuels.	11	25
2.	<b>Unit 2: Alcohol</b> Manufacture of Alcohols; Properties as engine fuels Alcohols and Gasoline blends; Performance in S. I. Engines: Methanol and gasoline blends; Effect of compression ratio; Alcohols in Stratified charge engines; Combustion characteristics in engines; Reformed alcohols use in CI Engines; Ignition accelerators; Alcohol Diesel emulsions; Dual fuel systems.	10	25
3.	<b>Unit 3:</b> Various vegetable oils for engines; Esterification Performance in engines; Biogas in engines; Performance and Emission characteristics; Shale oil, coal liquid and Tars and fuel; Performance and Emission characteristics.	6	15
4	<b>Unit 4: Gaseous Fuels:</b> Availability of CNG; Properties; Modification required to use in Engines; Performance and Emission characteristics of CNG, LPG in SI and CI Engines; Performance and Emission data for LPG; Hydrogen Production methods; Storage and handling; Performance; Safety aspects.	9	20
5	<b>Unit 5:</b> Layout of an electric vehicle; Advantages and limitation; specifications; System components; Electronic control system; High energy and power density batteries; Hybrid vehicles; Solar energy based vehicles; Hydrogen energy based vehicles; Latest development.	6	15

**Reference Books:**

1. Alternate fuels guide book, Bechtold R.L, SAE
2. Solar Engineering of Thermal Processes Duffie & Beckman John Wiley
3. Energy, the Biomass Option Bungay John Wiley
4. Introduction to Wind Energy Technology Lysen Georgia Inst.
5. Energy, Doolittle Matrix Pub.
6. Energy & Environment, Fowler McGraw Hill
7. Solar Energy S.P. Sukhatme Tata McGraw Hill

**Course Outcome:**

After successful completion of the course, student will be able to:

1. Know the properties and application of conventional fuels
2. Know the properties and application alternative fuels
3. Know the production method of various alternative fuels
4. Know about various electric and hybrid vehicles