GUJARAT TECHNOLOGICAL UNIVERSITY
AUTOMOBILE ENGINEERING
B. E. SEMESTER: VII

Subject Name: **Alternative Fuels and Engines**
Subject Code: **170205**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
4	0	2	6	70	30	30	20

Sr. No.	Course Contents	Total Hrs
1.	**Introduction:** Working process of I.C. Engine. Study of various parameters related to properties of different types of fuel (Rating of fuel, Ignition quality, volatility, calculations of Air / Fuel ratio, Calorific Value) as input and output in terms of results (Fuel efficiency, Fuel requirement, Engine efficiency and Engine life). Sources of fossil fuel, scope of availability of fossil fuel in future.	10
2.	**Need for Alternative Fuels:** Effects of constituents of Exhaust gas emission on environmental condition of earth (N_2 , CO_2, CO, NO_x, SO_2, O_2) Pollution created by Exhaust gas emission in atmosphere. Green house effect, Factors affecting green house effect. Study of Global Carbon Budget, Carbon foot print and Carbon credit calculations. Emission norms as per Bharat Standard up to BS – IV and procedures for confirmation on production.	6
3.	**Alcohol:** Sources of Methanol and Ethanol, methods of it's 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.	4

4.	**Bio Diesels:** Base materials used for production of Bio Diesel (Karanji oil, Neemoil, Sunflower oil, Soyabeen oil, Musturd oil, Palm oil, Jatropha seeds). Process of separation of Bio Diesel. Properties Diesel blended with vegetable oil, and difference in performance of Engine.	6
5.	**Hydrogen:** Hydrogen as a substitute fuel. Study Properties, Sources and methods of Production of Hydrogen, Storage and Transportation of hydrogen. Also, the economics of Application and Advantages of hydrogen (Liquid hydrogen) as fuel for IC engine/ hydrogen car. Layout of a hydrogen car. **Fuel Cells:** Concept of fuel cells based on usage of Hydrogen and Methanol. Power rating, and performance. Heat dissipation, Layout of fuel cell vehicle.	8
6.	**Biogas:** Introduction to Biogas system, Process during gas formation, Factors affecting biogas formation. Usage of Biogas in SI engine & CI engine. **LPG & CNG:** Properties of LPG & CNG as engine fuels, fuel metering systems, combustion characteristics, effect on performance, emission, cost and safety.	6
7.	**Solar Power:** Solar cells for energy collection. Storage batteries, layout of solar powered automobiles. Advantages and limitations.	4
8.	**Electric & Hybrid Vehicles:** Layout of an electric vehicles, advantages & limitations. Systems components, electronic controlled systems, high energy and power density batteries. Types of hybrid vehicles.	7
9.	**Vegetable Oils:** Various Vegetable oils for Engines – Esterification – Performance and emission characteristics. **Synthetic Alternative Fuels:** Di-Methyl Ether **(**DME), P-Series, Eco Friendly Plastic fuels (EPF).	2
10.	**Non conventional I.C. Engine:** Introduction, Duel fuel / Multi fuel engine, stratified charge, adiabatic engine, Variable Compression Ratio engine, Free piston engine, Sterling engine, Wankel engine.	7

Term Work:

The term work shall be based on the topics mentioned above.

Text Book:

1. Alternate Fuels by Dr. S. Thipse, Jaico Publications.

Reference Books:

1. “Automotive Emission Control” by Crouse, AND Anglin – McGraw Hill
2. “Alternative Fuels Guidebook” by Bechtold R.
3. SAE Paper nos. 840367, 841333, 841334
4. “The properties and performance of modern alternative fuels” – SAE Paper no. 841210.
5. “Internal Combustion Engines” by Ganeshan – Tata McGraw Hill
6. “Internal Combustion Engines” by Heywood John