Subject Code: 01AE0505

Subject Name: Alternative fuels and power systems

B.Tech. III Year – (Sem-5) Automobile Engineering

Type of course: Under Graduate

Prerequisite: Elements of Mechanical Engineering, Internal Combustion Engine

Rationale: Understanding & Analysis Alternative Fuels for Engine

Course Outcome

Students will be able to

1. The student will understand the various alternative fuels available
2. Determine alternative fuels properties, performance characteristics, combustion characteristics, emission characteristics
3. Determine Engine Modification required for alternative fuels
4. Determine Electric, Hybrid and fuel cell technologies

Teaching and Examination Scheme:

Teaching Scheme(Hours)			Credits	Evaluation Scheme					Total Marks
				Theory Marks			Practical Marks		
Theory	Tutorial	Practical		ESE (E)	IA	CSE	Viva(V)	TermWork (TW)	
3	0	2	4	50	30	20	25	25	150

SR NO	CONTENTS	Duration	Weightage
1	**Alcohols as Fuel** Introduction to alternative fuels. – Need for alternative fuels – Availability of different alternative fuels for SI and CI engines. Alcohols as fuels. Production methods of alcohols. Properties of alcohols as fuels. Methods of using alcohols in CI and SI engines. Blending, dual fuel operation, Performance emission and combustion characteristics in CI and SI engines. Emulsification of alcohol and diesel	08	19

2	**Biodiesel as Fuels** Raw materials used for production of Bio Diesel (Karanji oil, Neemoil Sunflower oil, Soya been oil, Mustard oil, Palm oil, Jatropha seeds, Algae). Production process of Bio Diesel. Properties Diesel blended with vegetable oil, Difference in performance of Engine blended with biodiesel	07	19
3	**Biogas, Natural gas and LPG as Engine Fuel** Production methods and Properties of Biogas, Natural gas and LPG, CO2, and H2S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines. combustion characteristics, storage, cost and safety of NG and LPG	08	19
4	**Hydrogen as Engine Fuel** Production methods of hydrogen. Combustive properties of hydrogen. Problems associated with hydrogen as fuel and solutions. Different methods of using hydrogen in SI and CI engines. Performance, emission and combustion analysis in engines. Hydrogen storage – safety aspects of hydrogen.	05	15
5	**Electric, Hybrid and Fuel cell vehicles** Layout of Electric vehicle and Hybrid vehicles – Merits and demerits of electric and hybrid vehicles. System components, Electronic control system – Different configurations of Hybrid vehicles. Power split device. High energy and power density batteries – Fundamentals of Fuel cell vehicles. Fuel cells principle, working, Types	06	19
6	**Other Alternative Fuels** Di-Methyl Ether (DME), Pyrolysis gas/oil, Synthetic gas/oil from plastic, rubber, coal, wood etc., Eco Friendly Plastic fuels (EPF).	03	09

Distribution of Theory Marks

R Level	U Level	A Level	N Level	E Level
25	25	20	15	15

Legends: R: Remembrance**; U:** Understanding**; A:** Application, **N:** Analyze**,** and **E:** Evaluate

Reference Books:

1. Alternative Fuels Guidebook by Bechtold R.
2. Alternative Fuels by Arumugam S. Ramadhas

3. Modern Electric, Hybrid Electric and Fuel cell Vehicles by Mehrdad Ehsani,Yimin Gao,Ali emadi

List of the Experiment

1	Flash and fire point density measurement test of biofuel – alcohol
2	Flash and fire point density measurement test of biofuel – Biodiesel
3	Cloud Point Temperature, Pour Point temperature measurement of alcohol ,Biodiesel
4	Emission analysis of CNG based vehicle.
5	Emission analysis of Biofuels based vehicle
6	Inspect and study different components of CNG based vehicle
7	Study Electric Hybrid Vehicles
8	Study of Fuel cell based vehicles
9	Study of different topological configurations of Electric Hybrid /Fuel cell Vehicles
10	Study of solar powered vehicles

List of Open Source Software/learning website:

1) www.nptel.ac.in
2) www.coursera.org