

B.E Semester: 5 Automobile Engineering

Subject Name: Fuels, Alternative Fuels and Lubricants (AE505-N-E)

[Dept. Elect.-1]

A. Course Objective:

The course should enable the student to:

- Understand the various production processes of fuels and lubricants
- Understand the requirement and classification of lubricants
- Know about the properties and various testing methods of fuels
- Know about the fuel characteristics.

B. Teaching / Examination Scheme:

Teaching Scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
3	0	2	5	4	3	70	30	20	30	150

C. Detailed Syllabus:

Unit No.	Details
1	Fuels for I.C. engines Types of Fuels, Structure of petroleum, refining process, thermal and catalytic cracking, products of refining process, manufacture of lubricating oil base stocks and finished automotive lubricants Liquid and gaseous fuels, heating value of fuels, higher and lower heating values, chemical structure of hydro-carbons SI Engine fuels, Volatility characteristics, desirable characteristics of SI Engine fuels, knock rating and additives, alternate fuels for SI engines. CI engine fuels, desirable characteristics, cetane rating.
2	Alternative Liquid Fuels Need 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. Alcohol Sources of Methanol and Ethanol, methods of its 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. Bio Diesels: Base materials used for production of Bio Diesel (Karanja oil, Neemoil, Sunflower oil, Soyabean oil, Mustard oil, Palm oil, Jatropha seeds). Process of separation of Bio Diesel. Properties Diesel blended with vegetable oil, and difference in performance of Engine. 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)
3	Alternative Gaseous Fuels 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. 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.
4	Lubricants Specific requirements for automotive lubricants, Types of lubricating system, Wet sump Lubrication, splash lubrication, Semi pressure Lubrication, Full pressure lubrication, cooling of lubricating oils, dry sump lubrication, crankcase ventilation system, types of greases, characteristics of lubricating oils, viscosity, factors affecting viscosity and viscosity index, additives in lubricant, grades of lubricating oils and their designation, deterioration in lubricating oils.
5	Cooling system Introduction, Forced cooling systems, Thermo syphon cooling, Thermostat cooling, Evaporative cooling. Cooling air and water requirements, cooling systems, components of water cooling systems.

Total hours (Theory):48
Total hours (Practical):32
Total hours:80

D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	Topic No
1	1 st ,2 nd ,	Unit 1	20%	1
2	3 rd 4 th .5 th ,6 th	Unit 2	20%	2
3	7 th , 8 th ,9 th	Unit 3	20%	3
4	10 th .11 th . 12 th	Unit 4	20%	4
5	13 th , 14 th ,15 th ,16 th	Unit 5	20%	5

E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2	Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal Weight age should be given to all topics while teaching and conduction of all examinations.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.

5	Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
7	The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures. Suggested list of experiment is given below

F. List of Practical:

1	Study of International and National standards for fuels and lubricants.
2	Draw the chart & describe distillation process of crude.
3	Determination of viscosity of lubricating oil at different temperature.
4	Determination of flash and fire point of given sample fuel.
5	Determination of cloud and pour point of given sample of oil.
6	Testing of fuels - Ultimate analysis, proximate analysis.
7	To find Calorific value of liquid fuels.
8	To find Calorific value of gaseous fuels.
9	Study of Octane and Cetane Number of fuels.
10	Experimental study of Cooling systems.
11	Experimental study of Lubricant systems.

G. Students Learning Outcomes:

1	The student can identify different areas of Fuels, Alternative Fuels and Lubricants.
2	Can find the applications of all the areas in day to day life.

H. Text Books & Reference Books:

1	V.Ganesan, "Internal Combustion Engines" Tata McGraw-Hill Publishing Co. Newdelhi
2	M.L.Mathur and P.Sharma "A course in internal combustion engines", Dhanpatrai Publications
3	Brame, J.S.S. and King, J.G. – Fuels – Solids, Liquids, Gaseous.
4	Francis, W – Fuels and Fuel Technology, Vol. I & II
5	Hobson, G.D. & Pohl.W- Modern Petroleum Technology
6	A.R.Lansdown – Lubrication – A practical guide to lubricant selection – Pergamon press – 1982.
7	Raymond.C.Gunther – Lubrication – Chilton Book Co., - 1971.
8	K.M.Gupta vol-1-Automobile Engineering-umesh publications.
9	Alternate Fuels by Dr. S. Thipse, Jaico Publications
10	Automotive Emission Control" by Crouse, AND Anglin – McGraw Hill.
11	Alternative Fuels Guidebook" by BechtoldR..