

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

FUELS & LUBRICANTS (Code: 3330204)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	3rd Semester

1. RATIONALE

Fuels are the energy sources for any vehicle and lubricants are used to reduce energy losses due to friction. Both are available in very wide range but only some of them have found their application in vehicle because of their some desirable properties. Their use not only affects the engine performance and vehicle life but also affect the environment. Due to different chemical composition different fuels behave differently during combustion process. Also their end products are different for different combination of parameters, like pressure, temperature, air etc. To justify the selection of proper fuel and lubricants for particular vehicle and particular assembly students of automobile engineering must have knowledge of fuels and lubricants. This course enables students of automobile engineering to understand the fuels and lubricants with reference to vehicle performance.

2. COMPETENCIES: (Programme Outcomes (POs) According to NBA terminology)

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency:

Select proper fuel and lubricant depending upon application for better performance and maintenance of automobiles.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Introduction to Fuels	1a. Describe the term fuels its types & uses 1b. Describe the term lubricants its types & uses. 1c. Explain the origin and manufacturing of fuel & lubricants.	1.1 Basic requirements of a fuel & lubricant. 1.2 Types of fuels & lubricants its uses & sources 1.3 Theory of origin and accumulation of crude oil 1.4 Methods of searching crude oil 1.5 Recovery of crude oil 1.6 Classification of crude oil 1.7 Classification of hydrocarbon 1.8 Structure of various hydrocarbon 1.9 Fractional distillation and classification of refinery products 1.10 Various refining processes 1.11 Blending and treatment of gasoline
Unit – II Properties and Additives of Fuel	2a. Explain the properties of fuels and their effect on engine performance 2b. Explain the various additives used to enhance performance of fuels	2.1 Various desirable properties of SI engine fuels 2.2 Their effect on engine performance 2.3 Additives of gasoline 2.4 Various desirable properties of CI engine fuels 2.5 Their effect on engine performance 2.6 Additives of diesel
Unit – III Combustion Process and Rating of Fuels	3a. Describe the phenomenon of combustion in SI and CI engine 3b. Appreciate the terminologies involved in combustion and their effect 3c. Explain the qualities of fuels	3.1 Combustion in SI engine 3.11 (i) Normal and abnormal combustion 3.12 (ii) Factors affecting normal combustion 3.13 (iii) Ignition Lag and factors affecting it 3.14 (iv) Pre-ignition and its effects 3.15 (v) Detonation, its effects and factors affecting it and prevention 3.2 Combustion in CI engine 3.21 (i) Phases of combustion in CI engine 3.22 (ii) Factors affecting combustion in CI engine 3.23 (iii) Ignition Lag and factors affecting it 3.24 (iv) Diesel knock, its effects and factors affecting it and prevention 3.3 Rating of Fuel 3.31 (i) Octane number, merits and demerits of higher octane fuel and normal octane fuel 3.32 (ii) Cetane number
Unit – IV Introduction to Engine Friction and Lubricants	4a. Explain various frictional losses 4b. Explain the phenomenon of lubricant 4c. Describe the importance	4.1 Engine frictional losses 4.2 Factors affecting frictional losses 4.3 Boundary lubrication 4.4 Hydro dynamic lubrication 4.5 Classification and types of lubricating oil

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	of lubricant and types of lubricants 4d. Describe the manufacturing of lubricants 4e. Explain the term grease	(based on crude oil, synthetic oil) 4.6 Basic requirements of lubricants 4.7 Distillation process to get lubricating oil from crude oil 4.8 Various treatment given to the lubricating oil 4.9 Types of grease and its characteristics
Unit – V Properties, Gradation and Additives of Lubricants	5a. Explain various properties of lubricating oil 5b. Describe gradation of lubricating oil 5c. Explain requirement of additives	5.1 various properties of lubricating oil 5.2 Gradation of lubricating oil 5.3 Introduction of ISO Cleanliness code. 5.4 Function and type of additives of lubricating oil
Unit- VI Alternative Fuel	6a. Describe alternative fuels	6.1. Alternative fuels and their economics-like, Alcohol, Ethanol, Methanol, Hydrogen, LPG, CNG, Bio Gas, Bio diesel
Unit-VII Measurement of Various Properties of Fuels & Lubricant	7a. Describe various instruments used for measuring various properties of fuels & lubricants. 7b. Describe the experimental procedures.	7.1 Measurement of various properties of fuels & lubricants. 7.2 Safety precautions while measuring properties of fuels & lubricants.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Introduction to Fuels	7	7	7	0	14
II	Properties and Additives of Fuel	7	3	4	0	7
III	Combustion Process and Rating of Fuels	6	0	7	7	14
IV	Introduction to Engine Friction and Lubricants	6	3	7	4	14
V	Properties, Gradation and Additives of Lubricants	6	3	4	0	7
VI	Alternative Fuel	6	0	3	4	7
VII	Measurement of Various Properties of Fuels & Lubricant	4	3	4	0	7
Total		42	19	36	15	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (Course Outcomes in psychomotor and affective domain) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of Programme Outcomes/Course Outcomes in affective domain as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	UnitNo.	Practical Exercise(Any Seven) (Course Outcomes in Cognitive Domain according to NBA terminology)	Apprx. Hrs. Required
1	I	Draw the chart & Describe distillation process of crude oil.	4
2	II	Determination of viscosity of given sample of fuel using u-tube viscometer..	4
3	V	Determination of viscosity of lubricating oil at different temperature.	4
4	II	Determination of flash and fire point of given sample of fuel.	4
5	II	Determination of specific gravity of given sample of fuel by westphal Balance	4
6	V	Determination of carbon residue of lubricating oil	4
7	III	Study of CFR engine and knock meter.	4
8	II	Study of measuring API gravity of fuel.	4
9	V	Determination of cloud and pour point of given sample of oil.	4
		Total	28

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- a. Internet based assignment related to crude oil and refinery work.
- b. Visit of fuel station and collect data about instrument they used to check the properties of fuel and norms and precautions they are following
- c. Internet based assignment/literature survey for types of lubricants with their specific use
- d. Market survey to find out the specification of different types and brands of fuels and lubricants and their relative cost
- e. Internet based assignment to check the use of alternative fuels along with advantages of using them and problem encountered by using them

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- a. Visit to a fuel station
- b. Use of animation or video clips
- c. Chart (such as combustion phenomenon of SI and CI engine, distillation process)

9. SUGGESTED LEARNING RESOURCES**A. List of Books**

S.No.	Author	Title of Books	Publication
1	V.M. Domkundwar	Internal combustion engines	Dhanpat Rai Publishing Company (P) Ltd
2	K. M. Gupta	Automobile Engineering	Umesh Publication
3	C.P.Nakra,	Basic Automobile Engg.	Dhanpat Rai Publishing Company (P) Ltd
4	M.Popovich and Haring	Fuels and Lubricants	John Wiley & Sons, Inc
5	R.L.Bechtold	Alternative Fuels Guidebook	SAE Publication.
6	R. K. Rajput	Internal Combustion Engine	Laxmi Publication

B. List of Major Equipment/ Instrument

- a. Red wood viscometer
- b. Flash and fire point apparatus
- c. Fuel distillation plant
- d. Cloud and pour point apparatus
- e. Carbon residue tester
- f. CFR test engine
- g. U tube viscometer
- h. Westphal balance

C. List of Software/Learning Websites

1. http://www.youtube.com/watch?v=_hwzJUDWIQQ
2. http://www.youtube.com/watch?v=vscX_zawdQw
3. http://www.youtube.com/watch?v=Nd_pybvUgC
4. <http://www.youtube.com/watch?v=Cg9E112wMIU>
5. <http://www.youtube.com/watch?v=RSBs7PRo-fA>
6. <http://www.youtube.com/watch?v=9Py8-Xy9MKo>
7. <http://www.youtube.com/watch?v=NXYESrwhcPY>
8. <http://www.youtube.com/watch?v=h7GVHPEfpU4>
9. <http://www.youtube.com/watch?v=G33gfWg9a7k>
10. <http://www.youtube.com/watch?v=vundAm8q9Rw>
11. <http://www.youtube.com/watch?v=OIr-D-tIPyo>
12. <http://www.youtube.com/watch?v=agtYALodDcg>
13. <http://www.youtube.com/watch?v=suce6QNkVRI>
14. <http://www.youtube.com/watch?v=3Q1342fTH7A>
15. <http://www.youtube.com/watch?v=Qns7eXe4B4c>
16. <http://www.youtube.com/watch?v=R0g4RYMdAsI>
17. <http://www.youtube.com/watch?v=hk7NvgmvwnM>
18. http://www2.tech.purdue.edu/at/courses/at403/Lubrication_systems.ppt
19. <http://lubricantspecialist.files.wordpress.com/2011/10/basic-of-lubricants-lubrication.ppt>
20. http://mustafaozcanli.com/wp-content/uploads/2012/05/FAL_1.ppt

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. M. J. Pathak**, Head Automobile Engineering Department, Sir Bhavsinhji Polytechnic Inst., Bhavnagar.
- **Prof. A. C. Suthar**, Lecturer, Automobile Engineering Department, M.L. Institute of Diploma Studies, Bhandu
- **Prof. D. J. Gohel**, Lecturer, Automobile Engineering Department, C.U. Shah Polytechnic, Surendranagar

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. C. K. Chugh**, Professor, Department of Electronic Media
- **Dr. (Mrs.) Vandana Somkuwar**, Associate Professor, Department of Mechanical Engineering.