

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJURAT**

**COURSE CURRICULUM**  
**COURSE TITLE: AUTO ENGINES DIAGNOSIS AND TESTING**  
**(COURSE CODE:3360201)**

<b>Diploma Programme in which this course is offered</b>	<b>Semester in which offered</b>
Automobile Engineering	Sixth

**1. RATIONALE**

The course is designed to help the student in understanding the different troubles occurring in the Automobile Engines, their probable causes and remedies for better performance of engine. Various tests are to be performed to help in understanding the diagnosis of Engines. This course is helpful to develop fault tracing/ trouble shooting skill and maintenance skill, which is essentially expected from technicians.

**2. COMPETENCY**

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competency:

- **Remedy engine troubles based on diagnosis and testing using suitable instruments and tools.**

**3. COURSE OUTCOMES (CO's)**

Students will be able to:

- i. Identify and diagnose the causes of malfunctioning of an engine.
- ii. Rectify engine troubles based on symptoms and causes.
- iii. Use the suitable instrument and tools for diagnosis and testing of automotive engine systems.
- iv. Remove engine from automobile, disassemble and rectify faults.
- v. Develop an attitude of relying on systematic method of working using standard trouble shooting procedure rather than taking ad-hoc decisions.

**4. TEACHING AND EXAMINATION SCHEME**

<b>Teaching Scheme (In Hours)</b>			<b>Total Credits (L+T+P)</b>	<b>Examination Scheme</b>				<b>Total Marks</b>
				<b>Theory Marks</b>		<b>Practical Marks</b>		
<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>ESE</b>	<b>PA</b>	<b>ESE</b>	<b>PA</b>	<b>150</b>
<b>4</b>	<b>0</b>	<b>2</b>	<b>6</b>	<b>70</b>	<b>30</b>	<b>20</b>	<b>30</b>	

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

## 5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes ( In Cognitive Domain)	Topics and Sub-topics
<b>Unit – I Tools and Techniques for maintaining Automobile Engine System.</b>	1a. Describe tools & instruments for automobile engines maintenance. 1b. Explain step by step procedure for dismantling and cleaning of engine.	1.1 Engine Maintenance Tools and instruments. - General and Special Tools - Measuring Tools and Instruments 1.2 Engine removal preparation and procedure. 1.3 Upper engine Disassembly and cleaning. 1.4 Lower engine Disassembly and cleaning.
<b>Unit – II Inspection, Testing and Reconditioning of Engine Components.</b>	2a. Explain various tests for testing the automobile engines. 2b. Describe Engine troubles and their causes and remedies. 2c. Explain Reconditioning/rectifying and replacement of different engine components.	2.1 Different Engine tests like, compression test, vacuum test, cylinder leakage test etc. 2.2 Inspection of different engine components. 2.3 Types of defects (troubles), likely to occur in different engine components and their analysis. 2.4 Causes and remedies for different troubles in engine components. 2.5 Reconditioning methods (Grinding, Boring, Honing and Lapping) of different engine components. 2.6 Replacement procedure of different engine components.
<b>Unit– III Inspection, Service and Repair of Fuel System Components for Petrol &amp; Diesel Engines.</b>	3a. Explain servicing of different fuel system components. 3b. Explain the Service of the air and fuel filters. 3c. Apply knowledge of fuel system parts/ assemblies- Carburetor system, MPFI, LPG & CNG system to solve problems. 3d. Explain testing of fuel injectors and nozzles 3e. Explain calibration and servicing of fuel pump. 3f. Explain replacement of fuel filters, bleeding of fuel feed system etc.	3.1 Inspection, repair and service of fuel tank, fuel lines and fuel filters. 3.2 Inspection, repair, testing and service of fuel pump. 3.3 Carburettor cleaning, servicing and adjustment. 3.4 Servicing of Air cleaners. 3.5 Inspection, repair and service of petrol injection system (MPFI). 3.6 Inspection, repair and service of LPG/CNG system 3.7 Testing and adjustment of fuel injectors and nozzles. 3.8 Calibration and phasing of fuel injection pump. 3.9 Servicing of the fuel feed pump. 3.10 Procedure of checking and setting of governors. 3.11 Checking and setting of injection timing. 3.12 Replacement of the fuel filters/

Unit	Major Learning Outcomes ( In Cognitive Domain)	Topics and Sub-topics
		elements. 3.13 Bleeding of the diesel fuel feed system.
<b>Unit– IV Servicing, Maintenance and Overhauling of Cooling &amp; Lubricating System.</b>	4a. Explain engine overheating causes. 4b. Describe Repair of cooling system leakage 4c.Explain Service/ Inspection, servicing and testing of water pump, thermostat valve, fan belt etc. 4d.Justify oil change at prescribed interval. 4e. Explain causes for deterioration of engine oil, excess consumption of oil, etc. 4f. Explain servicing of various components of lubricating system.	4.1 Causes of engine overheating. 4.2 Servicing of the radiator and water jacket. 4.3 Detection and repairs of leakage in the radiator and cooling system. 4.4 Repairs, maintenance and over hauling of water pump. 4.5 Testing of thermostat valve. 4.6 Defects in the cooling system components, their causes and remedies. 4.7 Checking and testing of the lubricating system. 4.8 Servicing of oil pump and relief valve. 4.9 Deterioration of Engine oil. 4.10 Excessive oil consumption. 4.11 Low and high oil pressure. 4.12 Necessity of oil & filter change and its interval. 4.13 Servicing and replacement of the oil.
<b>Unit– V Engine Trouble Shooting.</b>	5a. Describe engine diagnostic equipment & tools, 5b.-Describe various engine symptoms, troubles and their causes 5c. Apply knowledge of engines repairs for solving troubles. 7d.Explain decarbonising, major & minor engine tune-up, overhauling of engines, etc.	5.1 Diagnostic equipment scans tools. 5.2 Causes for the different troubles and their remedial measures. 5.3 Procedure of decarburizing of the engine. 5.4 Procedure of major and minor Tune-Up. 5.5 Difference between major and minor overhaul of the engine.
<b>Unit– VI Engine Performance Testing.</b>	6a. Explain various testing equipment. 6b. Compute performance of engine using measured parameters. 6c. Prepare and interpret Graphical representation to get relationship of different parameters pertaining to IC engine.	6.1 Types of dynamometer, working principle, merits and limitations. 6.2 Engine power measurements and related terms. 6.3 Determination of I.H.P., B.H.P., F.H.P. and torque. 6.4 Computation of various efficiencies, mean effective pressure, specific fuel consumption. 6.5 Plotting of the graphs and interpretation of the data from the graph. 6.6 Morse Test on I.C. Engine.

## 6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – 56 Hours)			
			R Level	U Level	A Level	Total
I.	Tools and Techniques for Maintaining Automobile Engine System	04	02	00	03	05
II.	Inspection, Testing and Reconditioning of Engine Components.	10	04	04	06	14
III.	Inspection, Service and Repair of Fuel System Components for Petrol & Diesel Engines.	14	05	05	07	17
IV.	Servicing, Maintenance and Overhauling of Cooling & Lubricating System.	12	04	04	06	14
V.	Engine Trouble Shooting.	08	02	04	04	10
VI.	Engine Performance Testing	08	02	04	04	10
	<b>Total</b>	<b>56</b>	<b>19</b>	<b>21</b>	<b>30</b>	<b>70</b>

### Legends:

R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

## 7. SUGGESTED LIST OF EXPERIMENTS

The practical should be properly designed and implemented with an attempt to develop different types of skills (**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.

Sr. No.	Unit No.	Practical Exercises (Any Seven) (Outcomes' in Psychomotor Domain)	Hours (Total 28 hrs)
1	II	Demonstration of cylinder boring and honing	04
2	II	Demonstration of connecting rod alignment	04
3	II	Inspection and reconditioning of crankshaft	04
4	II	Demonstration of inspection and re-conditioning of valves and valve seat	04
5	III	Perform calibration and phasing of fuel injection pump	04
6	III	Perform service and testing of injectors	04
7	III	To perform testing and maintenance of LPG/CNG system.	04
8	IV	To perform Servicing of cooling system	04

9	IV	To perform Servicing of lubrication system	04
10	V	To perform Engine tune up	04
11	V	To perform Diagnosis of engine by scan tools	04
12	VI	To perform Testing of I.C. engine	04
13	VI	To perform Testing and setting of petrol injection system	04
14	VI	Demonstration of fuel consumption test on automobiles	04

## 8. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like: course/topic based seminars, internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects, Demonstration, Industrial Visits, Transparency, Video collection, Chart or Model preparation by students etc. These could be individual or group-based.

## 9. INSTRUCTIONAL STRATEGIES

- Case studies of typical maintenance problems in different makes of automobiles and problem based learning
- Arrange expert lectures of maintenance executives of different automobile companies
- Visit to authorized workshops of two wheeler and four wheelers.
- Collection of animation or video clips and presentation using same.
- Chart or Model preparation by students

## 10. SUGGESTED LEARNING RESOURCES

### (A) List of Books

Sr.No.	Author	Title of Books	Publication
1	R. B. Gupta	Automobile Engineering	Satya Prakashan, New Delhi
2	W.H.Crouse & D.L. Anglin	Automotive Mechanics	Tata Mc-Graw Hill Publishing Co. Ltd.-New Delhi
3	Ernest A. Venk , Edward Dale Spicer & Irving Augustus Frazee	Automotive maintenance and trouble shooting	American Technical Society
4	James D. Halderman	Automotive Engines Theory & Servicing, 5/e	Pearson Education India
5	Paul Dempsey	Troubleshooting and Repairing Diesel Engines	Mc-Graw Hill Professional
6	Anthony E. Schwaller	Total Automotive Technology	Cengage Learning, 2004
7	Tim Gills	Automotive Service: Inspection, Maintenance, Repair	Cengage Learning, 2011
8	R.C. Mishra, K. Pathak	Maintenance Engineering And Management	PHI Learning Pvt. Ltd., 2004

Sr.No.	Author	Title of Books	Publication
9	C.P. Nakra	Diesel Engine Mechanics	Dhanpat Rai Publication Co. (P) Ltd.
10	Jain and Astana	Automobile Engineering	Tata Mc-Graw Hill Publishing Co. Ltd.-New Delhi
11	N.K.Giri	Automotive Technology	Khanna Publication Co. (P) Ltd.

### (B) List of Major Equipment/ Instrument

- i. Tool Box (2 sets atleast for Intake of 60 students.)
- ii. Measuring instruments and gages like Vernier caliper, Micrometer, Filler gauge, Thread gauge etc.
- iii. Calibration apparatus for fuel injector.
- iv. Calibration apparatus for fuel injection pump
- v. Dynamometer
- vi. Morse Test Apparatus
- vii. Various charts for safety slogan, servicing & overhauling of various systems of Automobile Engine.

### (C)List of Software/Learning Websites

Sr. No	Name of Topic		Sample Video URL Address
1	Top 10 Favorite Tools	<1>	<a href="http://www.youtube.com/watch?v=ZqJIaXXLAvs">http://www.youtube.com/watch?v=ZqJIaXXLAvs</a>
		<2>	<a href="https://www.youtube.com/watch?v=P3ugoKz1dLA&amp;index=5&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb">https://www.youtube.com/watch?v=P3ugoKz1dLA&amp;index=5&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb</a>
2	Diagnosis of Engine Problem	<1>	<a href="http://www.youtube.com/watch?v=Yz-zh3N6AOo">http://www.youtube.com/watch?v=Yz-zh3N6AOo</a>
		<2>	<a href="https://www.youtube.com/watch?v=pLNgEdJ2dvi&amp;index=4&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb">https://www.youtube.com/watch?v=pLNgEdJ2dvi&amp;index=4&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb</a>
3	Main Parts of Car Engine	<1>	<a href="http://www.youtube.com/watch?v=xbIY-2XoJxw">http://www.youtube.com/watch?v=xbIY-2XoJxw</a>
		<2>	<a href="https://www.youtube.com/watch?v=ZLOGyUIW0Rs&amp;index=1&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb">https://www.youtube.com/watch?v=ZLOGyUIW0Rs&amp;index=1&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb</a>
4	Cleaning of Car Engine	<1>	<a href="http://www.youtube.com/watch?v=PAR5xFWCTfg">http://www.youtube.com/watch?v=PAR5xFWCTfg</a>
		<2>	<a href="https://www.youtube.com/watch?v=g-cHvRI7n0k&amp;index=3&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb">https://www.youtube.com/watch?v=g-cHvRI7n0k&amp;index=3&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb</a>
5	How to Clean Fuel Injectors	<1>	<a href="http://www.youtube.com/watch?v=jeRqmggQVOs">http://www.youtube.com/watch?v=jeRqmggQVOs</a>
		<2>	<a href="https://www.youtube.com/watch?v=1Eko94ch65Y&amp;index=2&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb">https://www.youtube.com/watch?v=1Eko94ch65Y&amp;index=2&amp;list=PLPvqVA0h0J6h_KZG_XWOcYwcTZJU22Vkb</a>

OR

Complete Video Play-list available on below single URL address

<https://www.youtube.com/playlist?list=PLPvqVA0h0J6hMD30iKtGqjg1QYikZxJGV>

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### **Faculty Members from Polytechnics**

- Mr.D.A.Dave, H.O.D., Auto.Dept. Sir Bhavsinhji Polytechnic Inst., Bhavnagar.
- Mrs.M.N.Vibhakar, Lecturer, Automobile Dept. DR.S&SS Gandhi Polytechnic, Surat
- Mr. S.V. Trivedi, H.O.D., Auto. Dept., Parul Institute of Technology, Waghodia, Vadodara.
- Mr.A.C.Suthar, Lecturer, Automobile Dept. MLIDS Polytechnic, Bhandu

### **Coordinator and Faculty Members from NITTTR Bhopal**

- Prof. K. K. Jain, Professor, Deptt. of Mechanical engineering, NITTTR, Bhopal
- Dr. C. K. Chugh, Professor, Deptt. of Mechanical engineering, NITTTR, Bhopal
- Dr. A.K. Sarathe, Associate Professor, Deptt. of Mechanical engineering, NITTTR, Bhopal