

**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>	<p>1a. Describe tools &amp; instruments for automobile engines maintenance.</p> <p>1b. Explain step by step procedure for dismantling and cleaning of engine.</p>	<p>1.1 Engine Maintenance Tools and instruments.</p> <ul style="list-style-type: none"> <li>- General and Special Tools</li> <li>- Measuring Tools and Instruments</li> </ul> <p>1.2 Engine removal preparation and procedure.</p> <p>1.3 Upper engine Disassembly and cleaning.</p> <p>1.4 Lower engine Disassembly and cleaning.</p>
<b>Unit – II Inspection, Testing and Reconditioning of Engine Components.</b>	<p>2a. Explain various tests for testing the automobile engines.</p> <p>2b. Describe Engine troubles and their causes and remedies.</p> <p>2c. Explain Reconditioning/rectifying and replacement of different engine components.</p>	<p>2.1 Different Engine tests like, compression test, vacuum test, cylinder leakage test etc.</p> <p>2.2 Inspection of different engine components.</p> <p>2.3 Types of defects (troubles), likely to occur in different engine components and their analysis.</p> <p>2.4 Causes and remedies for different troubles in engine components.</p> <p>2.5 Reconditioning methods (Grinding, Boring, Honing and Lapping) of different engine components.</p> <p>2.6 Replacement procedure of different engine components.</p>
<b>Unit– III Inspection, Service and Repair of Fuel System Components for Petrol &amp; Diesel Engines.</b>	<p>3a. Explain servicing of different fuel system components.</p> <p>3b. Explain the Service of the air and fuel filters.</p> <p>3c. Apply knowledge of fuel system parts/ assemblies- Carburetor system, MPFI, LPG &amp; CNG system to solve problems.</p> <p>3d. Explain testing of fuel injectors and nozzles</p> <p>3e. Explain calibration and servicing of fuel pump.</p> <p>3f. Explain replacement of fuel filters, bleeding of fuel feed system etc.</p>	<p>3.1 Inspection, repair and service of fuel tank, fuel lines and fuel filters.</p> <p>3.2 Inspection, repair, testing and service of fuel pump.</p> <p>3.3 Carburettor cleaning, servicing and adjustment.</p> <p>3.4 Servicing of Air cleaners.</p> <p>3.5 Inspection, repair and service of petrol injection system (MPFI).</p> <p>3.6 Inspection, repair and service of LPG/CNG system</p> <p>3.7 Testing and adjustment of fuel injectors and nozzles.</p> <p>3.8 Calibration and phasing of fuel injection pump.</p> <p>3.9 Servicing of the fuel feed pump.</p> <p>3.10 Procedure of checking and setting of governors.</p> <p>3.11 Checking and setting of injection timing.</p> <p>3.12 Replacement of the fuel filters/</p>

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

- i. Case studies of typical maintenance problems in different makes of automobiles and problem based learning
- ii. Arrange expert lectures of maintenance executives of different automobile companies
- iii. Visit to authorized workshops of two wheeler and four wheelers.
- iv. Collection of animation or video clips and presentation using same.
- v. 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



**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM**  
**COURSE TITLE: AUTO TRANSMISSION-MECHANISM DIAGNOSIS AND TESTING**  
**(COURSE CODE:3360202)**

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

**1. RATIONALE**

This course is designed to develop the deeper understanding in the students about the troubles occurring in automobile transmission and chassis system and its probable causes. They will be exposed to systematic method of working using standard trouble shooting procedure rather than taking adhoc remedial measures. This will make the learning more interesting and would develop desired skills for proper maintenance of different component of auto transmission mechanisms.

**2. COMPETENCY**

The course content should be taught and implemented with the aim to develop required skills in the students so they can acquire the following competency:

- **Remedy automobile transmission systems based on diagnosis and testing using suitable instruments and tools.**

**3. COURSE OUTCOMES**

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain so that they can demonstrate the following course outcomes.

- i. Identify probable faults/troubles and their causes in automobile transmission systems.
- ii. Use suitable instruments, tools and service manuals for diagnosis and testing of automobile transmission systems
- iii. Remove automobile units by using proper tools and procedures: gear box, brakes, suspension, final drive, etc.
- iv. Disassemble, inspect, and repair various automobile units by using proper tools and procedures: gear box, differential, brakes, suspension, steering, etc.
- v. Follow safety rules for repair and maintenance of various transmission systems of automobile vehicle.



#### 4. TEACHING AND EXAMINATION SCHEME

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

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

#### 5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in Cognitive domain)	Topics and Sub-topics
<b>Unit – I Trouble Shooting of Clutch</b>	1a. Identify various troubles in clutch unit and fluid coupling, 1b. Analyse and Rectify various troubles in clutch unit 1c. Explain overhauling of Clutch	1.1 Troubles in clutch units, its causes and rectification 1.2 Inspection procedure and rectification 1.3 Reconditioning of clutch components 1.4 Clutch adjustment 1.5 Lubrication of clutch units and linkages 1.6 Troubles in fluid coupling, its causes and remedies
<b>Unit – II Inspection, Testing and Overhauling of Gear Box.</b>	2a. Identify various troubles in gear box 2b. Analyse and Rectify various troubles in gear box 2c. Explain overhauling of Gear box	2.1 Troubles in gear box unit, their causes and remedies 2.2 Inspection of components of gear box 2.3 Rectification of various troubles in components 2.4 Overhauling of gearbox
<b>Unit– III Inspection and Trouble Shooting of Propeller Shaft - Universal Joint &amp; Rear Axle Assembly</b>	3a. Identify various troubles in propeller shaft, 3b. Analyse and Rectify various troubles in propeller shaft 3c. Explain Inspection procedure of propeller shaft 3d. Identify various troubles in rear axle assembly, 3e. Analyse and Rectify various troubles in rear axle assembly 3f. Explain Inspection procedure of rear axle	3.1 Troubles in propeller shaft assembly 3.2 Inspection procedure 3.3 Rectification of various troubles 3.4 Alignment of propeller shaft 3.5 Troubleshooting of Constant Velocity Joint 3.6 Troubles in rear axle assembly and their probable causes 3.7 Inspection procedure for rear axle assembly 3.8 Rectification of troubles in rear axle assembly 3.9 Procedure for road testing for proper performance of rear axle

Unit	Major Learning Outcomes (in Cognitive domain)	Topics and Sub-topics
	assembly	assembly
<b>Unit– IV Trouble Shooting of Front Axle and Steering System</b>	<p>4a. Identify various troubles in front axle and steering system</p> <p>4b. Analyse and Rectify various troubles in front axle and steering system</p> <p>4c. Explain Inspection procedure of front axle</p> <p>4d. Describe the procedure of Wheel alignment</p>	<p>4.1 Troubles in front axle and steering system, and their probable causes</p> <p>4.2 Inspection procedure for front axle</p> <p>4.3 Rectification of various troubles</p> <p>4.4 Procedure of testing for proper performance</p> <p>4.5 Wheel alignment procedure</p> <p>4.6 Troubles, its causes and remedies in power steering system (Hydraulic and Electronics)</p> <p>4.7 Troubleshooting of various steering gear box</p>
<b>Unit– V Trouble shooting of Braking System &amp; Service of Wheels and Tyres</b>	<p>5a. Identify various troubles in different braking system,</p> <p>5b. Analyse and Rectify various troubles in brake</p> <p>5c. Explain brake performance test</p> <p>5d. Identify various troubles in wheels,</p> <p>5e. Analyse and Rectify various troubles</p> <p>5f. Describe the procedure of tyre rotation and Wheel balancing</p> <p>5g. Explain the procedure of tyre retreading</p>	<p>5.1 Troubles in Mechanical, Hydraulic and Air braking system and their causes</p> <p>5.2 External checks of braking system</p> <p>5.3 Internal checks of system</p> <p>5.4 Rectification of various troubles</p> <p>5.5 Brake performance test</p> <p>5.6 Trouble shooting of sub assemblies of various brake systems like Master Cylinder, Vacuum Booster and Unloader Valve.</p> <p>5.7 Trouble shooting of Antilock Braking System.</p> <p>5.8 Different troubles and probable causes in Wheels and Tyres</p> <p>5.9 Inspection of rim and tyres</p> <p>5.10 Remedial Operation</p> <p>5.11 Rotation of tyre</p> <p>5.12 Tyre Retreading procedure</p> <p>5.13 Various troubles, causes and remedies in alloy wheels</p> <p>5.14 Wheel balancing procedure</p>
<b>Unit– VI Inspection, Servicing and Repair of Suspension System &amp; Chassis Frame.</b>	<p>6a. Identify various troubles in suspension system</p> <p>6b. Analyse and Rectify various troubles in suspension system</p> <p>6c. Identify various troubles in chassis frame,</p> <p>6d. Analyze and Rectify various troubles in chassis and frame</p> <p>6e. Explain repair and</p>	<p>6.1 Various troubles and their probable causes in suspension system</p> <p>6.2 Inspection procedure</p> <p>6.3 Remedial operation</p> <p>6.4 Lubrication of coil spring and leaf spring</p> <p>6.5 Various troubles and causes in chassis frame</p> <p>6.6 Inspection procedure</p> <p>6.7 Remedial operation</p> <p>6.8 Repairs and alignment of frame</p>

Unit	Major Learning Outcomes (in Cognitive domain)	Topics and Sub-topics
	alignment procedure of frame	6.9 Schedule for chassis lubrication 6.10 Types of instrument used

## 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
1.	Trouble Shooting of Clutch	08	02	04	04	10
2.	Inspection, Testing And Overhauling of Gear Box.	09	02	05	04	11
3.	Inspection and Trouble Shooting of Propeller Shaft - Universal Joint & Rear Axle Assembly	11	04	04	06	14
4.	Trouble Shooting of Front Axle and Steering System	08	02	04	03	09
5.	Trouble shooting of Braking System & Service of Wheels and Tyres	12	04	04	06	14
6.	Inspection, Servicing and Repair of Suspension System & Chassis Frame.	08	04	04	04	12
	<b>Total</b>	<b>56</b>	<b>18</b>	<b>25</b>	<b>27</b>	<b>70</b>

**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.

## 7. SUGGESTED LIST OF EXERCISES/PRACTICALS

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	I	Perform servicing of clutch	4
2	II	Perform servicing of gear box	4
3	II	Perform servicing of gear shifting mechanism	4
4	II	Perform servicing of automatic transmission	4
5	II	Perform servicing of fluid coupling	4
6	III	Perform servicing of final drive	4
7	IV	Perform servicing of steering system	4
8	V	Perform servicing of braking system	4

9	V	Perform bleeding of hydraulic braking system and pedal adjustment	4
10	V	Perform servicing of air brake system	4
11	V	Perform wheel alignment and balancing	4
12	VI	Wash and service the car.	4

## 8. SUGGESTED LIST OF 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, Video collection, Chart or Model preparation by students etc. These could be individual or group-based.

## 9. SPECIAL INSTRUCTIONAL STRATEGIES (If any)

- i. Case studies of typical maintenance problems in different makes of automobiles and problem based learning
- ii. Arrange expert lectures of maintenance executives of different automobile companies.
- iii. Visit to authorize workshop of two wheeler, three and four wheeler.
- iv. Collection of animation or video clips and presentation using same.
- v. 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.
3	Ernest A. Venk, Edward Dale Spicer & Irving Augustus Frazee	Automotive maintenance and trouble shooting	American Technical Society, 1963
4	Anthony E. Schwaller	Total Automotive Technology	Cengage Learning, 2004
5	Tim Gills	Automotive Service: Inspection, Maintenance, Repair	Cengage Learning, 2011
6	R.C. Mishra, K. Pathak	Maintenance Engineering And Management	PHI Learning Pvt. Ltd., 2004
7	C.P. Nakra	Automobile Engineering	Dhanpat Rai Publication Co. (P) Ltd.
8	N.K.Giri	Automotive Technology	Khanna Publication Co. (P) Ltd.

### B) List of Major Equipment/ Instrument with Broad Specifications

- a. Tool Box (2 sets atleast for Intake of 60 students.), Container for Oil Drain.

- b. Measuring instruments and gages like Vernier caliper, Micrometer, Filler gauge, Thread gauge etc.
- c. Various charts for safety slogan, servicing & overhauling of various systems.

### C) List of Software/Learning Websites

Sr.No	Topic / Video Title	URL Address
1	Connecting brake lines with a compression fitting	<a href="http://youtu.be/rF9p0KoYU4E?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/rF9p0KoYU4E?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
2	Checking a pressed in lower ball joint for wear	<a href="http://youtu.be/RWZq9WapzrM?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/RWZq9WapzrM?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
3	Changing a vehicle brake line	<a href="http://youtu.be/1ltBpXORbhU?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/1ltBpXORbhU?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
4	Car O Liner Mark 6 Frame Alignment Bench	<a href="http://youtu.be/w-j6T_Yj18g?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/w-j6T_Yj18g?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
5	Bench bleeding a brake master cylinder	<a href="http://youtu.be/KglpDbSI2F8?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/KglpDbSI2F8?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
6	ABS Brakes & More How to Troubleshoot ABS Disc Brakes	<a href="http://youtu.be/CqXmrex-DD4?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/CqXmrex-DD4?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
7	1998 Ford Ranger Rear Differential Reassembly	<a href="http://youtu.be/tQQ6OorGI4E?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/tQQ6OorGI4E?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
8	1998 Ford Ranger Rear Differential Disassembly	<a href="http://youtu.be/ISqhuAh8Eus?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/ISqhuAh8Eus?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
9	3D Wheel Alignment Manatec FOX 3D	<a href="http://youtu.be/iA327NEjwYw?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/iA327NEjwYw?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
10	Wheel balancing	<a href="http://youtu.be/yRoXUI3UR0k?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/yRoXUI3UR0k?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
11	Wheel balancer	<a href="http://youtu.be/Hl6Oy6jViEs?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/Hl6Oy6jViEs?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
12	Wheel Alignment Why cars need four wheel alignment	<a href="http://youtu.be/59aJ3YERo_I?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/59aJ3YERo_I?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
13	Symptoms of unbalanced tires	<a href="http://youtu.be/m9f63m31bVs?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/m9f63m31bVs?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
14	Symptoms of a worn wheel bearing while driving the vehicle	<a href="http://youtu.be/3ly_QReFOg0?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/3ly_QReFOg0?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
15	Symptoms of a warped brake rotor	<a href="http://youtu.be/F5Epq1wZ5Do?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/F5Epq1wZ5Do?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
16	MGB Differential Repair Part 2	<a href="http://youtu.be/xA6kA09XTIY?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/xA6kA09XTIY?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
17	How To Test, Troubleshoot, Remove & Replace a Power Steering Gear Box	<a href="http://youtu.be/QsbNTjqSjpk?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/QsbNTjqSjpk?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
18	How to Perform an Alignment on Your Car at Home	<a href="http://youtu.be/C8lnafFxtE4?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/C8lnafFxtE4?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
19	How To Diagnose A Clutch Problem	<a href="http://youtu.be/eqrFtnSZIMU?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/eqrFtnSZIMU?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
20	How to connect brake lines with	<a href="http://youtu.be/kBwQPoHWmyE?list=PLPvq">http://youtu.be/kBwQPoHWmyE?list=PLPvq</a>

	new fittings & a union	VA0h0J6ib8WNSsv11TOQKOMAQVHNz
22	How to bend brake lines with a pulley	<a href="http://youtu.be/-T7pxl2RtpQ?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/-T7pxl2RtpQ?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
23	Troubleshooting brake chamber	<a href="http://youtu.be/9r1b1_9T7L4?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/9r1b1_9T7L4?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
24	What Are Typical Steering and Suspension Problems	<a href="http://youtu.be/vdmdGQcbh50?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://youtu.be/vdmdGQcbh50?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>
	Complete Playlist URL <a href="http://www.youtube.com/playlist?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz">http://www.youtube.com/playlist?list=PLPvqVA0h0J6ib8WNSsv11TOQKOMAQVHNz</a>	

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### Faculty Members from Polytechnics

- **Prof. M. J. Pathak, H.O.D.**, Auto.Dept. Sir Bhavsinhji Polytechnic Inst., Bhavnagar.
- **Prof. S.V. Trivedi, H.O.D.**, Automobile Department, Parul Institute of Technology, Waghodia, Vadodara.
- **Prof. D. J. Gohel**, Lecturer, Automobile Department, C.U. Shah Polytechnic, Surendranagar.
- **Prof. A. C. Suthar**, Lecturer, Automobile Dept. MLIDS Polytechnic, Bhandu

### Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. K.K. Jain**, Professor, Department of Mechanical Engineering
- **Dr. C. K. Chugh**, Professor, Department of Mechanical Engineering



**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM  
COURSE TITLE: AUTO ELECTRICAL SYSTEM DIAGNOSIS AND TESTING  
(COURSE CODE:3360203)**

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

### 1. RATIONALE

Automotive electrical system is the most important feature of any modern vehicle. This course will help the students in understanding the troubles occurring in Automobile electrical system, there possible causes and remedial measures. The student will also develop the ability to use the instrument to check the performance of electrical units, identify the fault and rectify it.

### 2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire the following competency:

- **Remedy automotive electrical system parts and subassemblies based on diagnosis and testing using suitable instruments and tools.**

### 3. COURSE OUTCOMES (Cos)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain so that they can demonstrate the following course outcomes: .

- Identify various auto-electrical faults/troubles and their causes.
- Analyse and rectify various auto-electrical troubles with the help of troubleshooting charts
- Use standard acceptance test with the help of service manuals.
- Use suitable instrument and tools for diagnosis and testing of automotive electrical system.
- Follow safety rules for repair and maintenance of various automotive electrical systems and units.

### 4. 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	150
4	0	2	6	70	30	20	30	



**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 Automobile Battery</b>	1a.Explain different tests carried out on battery. 1b.Identify various troubles & its causes & remedies. 1c. Explain charging of the battery.	1.1 Different troubles Causes and remedies of the battery 1.2 Symptoms and effects of various battery failures 1.3 Different battery tests 1.4 Determination of battery condition and serviceability 1.5 Battery charging 1.6 Method of using battery tester 1.7 Periodical checking of the automobile battery
<b>Unit – II Ignition System</b>	2a.Explain tests carried out on the component of the ignition system. 2b.Identify various ignition failure, its causes & remedies. 2c.Explain servicing & adjustment of the ignition system timing & components. 2d. Explain method of using various tester	2.1 Different ignition failures, their causes and remedies 2.2 Quick checking of ignition system 2.3 Ignition service 2.4 Testing of different ignition system components by using different types of testing equipments (ignition coil tester, condenser tester, distributor tester, cam angle and RPM tester, ignition timing device) 2.5 Procedure of checking and setting of ignition timing 2.6 Use of oscilloscope ignition tester for diagnosis of ignition trouble 2.7 Testing of the transistorized ignition system and their components 2.8 Servicing testing and adjustment of the fly wheel magneto ignition system 2.9 Periodical checking of the automobile ignition system
<b>Unit– III Starter Motor and Its Circuits</b>	3a.Explain various starter motor failure, causes & remedies. 3b.Explain various tests on the starter motor. 3c.Describe maintenance & reconditioning of the starter motor.	3.1 Common troubles Causes and remedies in starter motor and its drive mechanism 3.2 Maintenance of the starter motor and its circuits 3.3 Reconditioning of the starter motor 3.4 Different starter tests and interpretation of the results 3.5 Testing of the starter switches 3.6 Method of using growler for starters
<b>Unit– IV Alternator and Regulators</b>	4a.Explain various tests on the alternator & regulator. 4b.Explain various regulator & alternator failure,	4.1 Different troubles in alternator, their causes and remedies 4.2 Testing procedure of alternator components

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	causes & remedies. 4c. Describe maintenance & reconditioning of the alternator.	4.3 Testing procedure of regulator 4.4 Precautions to be observed in the use of alternator and regulator 4.5 Maintenance of alternator and regulator 4.6 Periodical checking of the automobile alternator
<b>Unit- V Indicating and Warning Devices</b>	5a. Describe Procedure of testing the various indicating & warning devices. 5b. Describe troubles & ways for service of the various warning & indicating devices in the automobiles.	5.1 Troubles Causes and remedies in fuel level gauge and its circuits 5.2 Procedure of testing gauge and tank units 5.3 Troubles shooting of water temperature gauge 5.4 Troubles shooting of oil pressure gauge 5.5 Common troubles Causes and remedies in speedometer and odometer 5.6 Troubles, causes and remedies in flasher unit 5.7 Periodical checking of indicating and warning devices
<b>Unit- VI Wiring - Installation and Lighting &amp; Miscellaneous Electrical Equipment</b>	6a. Identify various problems in the wiring & repair it. 6b. Describe testing Procedure of various electrical equipment. 6c. Describe troubles & service of the various lighting & electrical equipment.	6.1 Troubles Causes and remedies in auto vehicle wiring 6.2 Testing of broken cable 6.3 Types of deterioration of cables, its causes and their remedies 6.4 Faults in the Automobile lighting circuits 6.5 Causes and remedies for various troubles 6.6 Method of focussing the head light 6.7 Troubles Possible causes and remedies in wind shield wiper and its circuit 6.8 Troubles Probable causes and remedies in electric horn (high frequency) relay and its circuit 6.9 Method of replacement of the horn components 6.10 Troubles shooting of electric fuel pumps 6.11 Troubles, causes and remedies in power window operating system

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
I.	Automobile battery	10	2	6	6	14
II.	Ignition system	10	3	5	6	14
III.	Starter motor and its circuits	07	0	3	4	07
IV.	Alternator and regulators	08	2	3	5	10
V.	Indicating and warning devices	07	2	2	5	09
VI.	Wiring – Installation and Lighting & miscellaneous electrical equipments	14	4	5	7	16
	<b>Total</b>	<b>56</b>	<b>13</b>	<b>24</b>	<b>33</b>	<b>70</b>

**Legends:** R = Remember, U = Understand, A= Apply and above Level (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.

## 7. SUGGESTED LIST OF EXERCISES/PRACTICAL

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	I	Test an automobile battery for its serviceability.	4
2	II	Test ignition coil, condenser, dwell angle, etc.	4
3	II	Set and check ignition timing of S.I. engine.	4
4	III	Test starter motor and its circuit for voltage drop, no-load and torque.	4
5	III	Test starter motor component.	4
6	IV	Test alternator and its components.	4
7	IV	Test output of alternator.	4
8	V	Test various indicating and warning devices.	4
9	V	Set and adjust head light of the automotive vehicle.	4
10	V	Set and adjust high frequency electric horn with its relay.	4

## 8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

To prepare Charts, Models. Seminars using power point presentations and Group discussion based on various probable troubles, its causes and how to rectify them for various automobile electrical system and its components.

## 9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. Case studies of typical maintenance problems in different makes of automobiles and problem based learning
- ii. Arrange expert lectures of maintenance executives of different automobile companies
- iii. Visit of authorized workshop of two and four wheeler.
- iv. Collection of animation or video clips and presentation using same.
- v. Internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects etc.

## 10. SUGGESTED LEARNING RESOURCES

### A) List of Books

Sr.No	Author	Title of Books	Publication
1	P. L. Kholi	Automobile Electrical Equipments	Tata McGraw Hill
2	C. P. Nakra	Auto Electrical Systems	Dhanpat Rai Publication
3	R. B. Gupta	Automobile Engineering	Satya Prakashan.
4	W.H.Crouse & D.L. Anglin	Automotive Electrical equipment	Tata McGraw Hill
5	Jain and Astana	Automobile Engineering (6 <sup>th</sup> Edition 2013)	Tata Mc-Graw Hill Publishing Co. Ltd.-New Delhi
6	Tom Denton	Automobile Electrical & Electronic system	Elsevier Butterworth-Heinemann
7	A. W. Judge	Automotive Electrical maintenance	Sir Isaac Pitman & Sons
8	J A Johnson	Automotive diagnosis And Tune up	Tata McGraw Hill

### B) List of Major Equipment/ Instrument

1. Hydrometer
2. Battery load tester
3. Ignition coil tester
4. Auto electrical test bench

**C) List of Software/Learning Websites**

Sr. No	Name of Topic	Sample Video URL Address
1	Battery load testing	<a href="http://www.youtube.com/watch?v=3QiKyjWWiRo">http://www.youtube.com/watch?v=3QiKyjWWiRo</a>
		<a href="https://www.youtube.com/watch?v=1FQMajuQ6j4&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=9">https://www.youtube.com/watch?v=1FQMajuQ6j4&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=9</a>
2	Ignition coil testing	<a href="http://www.youtube.com/watch?v=c1zhgsnyZWw">http://www.youtube.com/watch?v=c1zhgsnyZWw</a>
		<a href="https://www.youtube.com/watch?v=vG3LZr-lSYg&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=1">https://www.youtube.com/watch?v=vG3LZr-lSYg&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=1</a>
3	Setting ignition timing	<a href="http://www.youtube.com/watch?v=Wwp9rtTPPJc">http://www.youtube.com/watch?v=Wwp9rtTPPJc</a>
		<a href="https://www.youtube.com/watch?v=slrZafT8yNg&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=8">https://www.youtube.com/watch?v=slrZafT8yNg&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=8</a>
4	Setting of ignition timing	<a href="http://www.youtube.com/watch?v=wifTHbb06_I">http://www.youtube.com/watch?v=wifTHbb06_I</a>
		<a href="https://www.youtube.com/watch?v=skT2u6kmSP8&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=7">https://www.youtube.com/watch?v=skT2u6kmSP8&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=7</a>
5	Testing of starter motor	<a href="http://www.youtube.com/watch?v=UnmnWuuLfzE">http://www.youtube.com/watch?v=UnmnWuuLfzE</a>
		<a href="https://www.youtube.com/watch?v=FBuVYi-zlQ4&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=6">https://www.youtube.com/watch?v=FBuVYi-zlQ4&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=6</a>
6	Starter motor test	<a href="http://www.youtube.com/watch?v=9PWG6Il_ZJI">http://www.youtube.com/watch?v=9PWG6Il_ZJI</a>
		<a href="https://www.youtube.com/watch?v=V-2LSJYQkeU&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=4">https://www.youtube.com/watch?v=V-2LSJYQkeU&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=4</a>
7	Alternator voltage test	<a href="http://www.youtube.com/watch?v=Bzz7P3qNHcE">http://www.youtube.com/watch?v=Bzz7P3qNHcE</a>
		<a href="https://www.youtube.com/watch?v=uelF_CjtJ5g&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=5">https://www.youtube.com/watch?v=uelF_CjtJ5g&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=5</a>
8	Starter and voltage regulator	<a href="http://www.youtube.com/watch?v=-a0szYkjo9k">http://www.youtube.com/watch?v=-a0szYkjo9k</a>
		<a href="https://www.youtube.com/watch?v=xoBXdGAgqTk&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=3">https://www.youtube.com/watch?v=xoBXdGAgqTk&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=3</a>
9	Head light aligner	<a href="http://www.youtube.com/watch?v=ni6-NhH6uAE">http://www.youtube.com/watch?v=ni6-NhH6uAE</a>
		<a href="https://www.youtube.com/watch?v=EAqfAzAKYYU&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=2">https://www.youtube.com/watch?v=EAqfAzAKYYU&amp;list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj&amp;index=2</a>
OR		
Complete Video Play-list available on below single URL address		
<a href="https://www.youtube.com/playlist?list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj">https://www.youtube.com/playlist?list=PLPvqVA0h0J6h6aYnH2Spw-n7SK5OYXlpj</a>		

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### Faculty Members from Polytechnics

- **Prof M.J.Pathak**, H.O.D., Automobile Department, Sir Bhavsinhji Polytechnic Inst., Bhavnagar.
- **Prof S.V. Trivedi**, H.O.D., Automobile Department, Parul Institute of Technology, Waghodia, Vadodara.
- **Prof. D. J. Gohel**, Lecturer, Automobile Department, C.U.Shah Polytechnic, Surendranagar
- **Prof. Sulay Patel**, H.O.D., Automobile Department, L.J. Polytechnic, Ahmadabad.

### Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. K.K. Jain**, Professor, Department of Mechanical engineering
- **Dr. C.K. Chugh**, Professor, Department of Mechanical engineering

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM  
COURSE TITLE: VEHICLE AIR CONDITIONING  
(COURSE CODE:3360204)**

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

### 1. RATIONALE

Vehicle air conditioning is the important feature of any modern vehicle. This course is designed to learn the fundamental principles and basic concept of vehicle air conditioner system. Also this will help the students in understanding the troubles occurring in vehicle air conditioner system, its possible causes and required measures. The student will develop the ability to use the instruments and tools to check and service the system.

### 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:

- **Troubleshoot using standard procedures for maintaining vehicle air conditioning and heating systems.**

### 3. COURSE OUTCOMES

Students will be able to:

- Identify various components of Vehicle Air conditioning and heating system.
- Apply various concepts related to Air conditioning and heating system.
- Operate manually and automatic Air conditioning and heating system.
- Diagnose various faults in air conditioning system by using suitable tools and instruments.
- Follow safety rules while servicing of Air conditioning and heating system.

### 4. 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	150
3	0	2	5	70	30	20	30	

**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 (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit – I VEHICLE AIR- CONDITI ONING FUNDAM ENTALS.</b>	1a.Explain concepts of air conditioning. 1b.Describe Air Conditioning Cycle. 1c.Describe functions of various components of air-conditioning, & heating system.	1.1 Fundamental principles and various Definitions (i) Heat and Modes of heat transfer. (ii) Latent Heat, Sensible Heat. (iii) Various Refrigerants and its properties. (iv) Air circulation and Humidity. (v) Cooling the air. (vi) Drying and cleaning the air. (vii) Due Point Temperature, Wet bulb/Dry bulb Temperature, Humidity, Relative Humidity. 1.2 Air-conditioning principle with Schematic layout (Vapour Compression Refrigeration cycle) 1.3 Basic Air-conditioning systems and operation of basic components (i) Magnetic clutch. (ii) Types of compressors. (iii) Condensers. (iv) Receiver Drier and Filter. (v) Different types of expansion valves and suction valves. (vi) Evaporator and heat sensing tube. (vii) Thermostats switch, Evaporator Pressure Regulator. (viii) Automotive air-conditioning controls. 1.4 Working of different automotive heaters.
<b>Unit – II VEHICLE AIR- CONDITI ONING AND HEATER SYSTEMS.</b>	2a.Describe various automotive Air-conditioner & Heater systems.	2.1 Manually controlled air-conditioner heater systems. (i) Different types of air-conditioner heater systems. (ii) Working and its operating modes. 2.2 Automatically controlled Air-conditioning systems. (i) Automatic temperature control. (ii) Operating modes. (iii) Different parts of automatic controlled air conditioning system. (iv) Humidity Control (Humidifier and Dehumidifier) 2.3 Field installed air-conditioners. 2.4 Automatic climate control.

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
<b>Unit– III HEATER AND AIR- CONDITI ONER TROUBLE SHOOTIN G.</b>	3a.Explain Diagnosis & Testing of Automotive air-conditioner system. 3b. Describe fire prevention & shop safety.	3.1 Safety in the shop. (i) Fire prevention (ii) Shop safety rules (iii) Air-conditioner service safety rules 3.2 Servicing heating system (i) Car heater system, trouble diagnosis chart 3.3 Causes of Air-conditioner failure 3.4 Trouble shooting the Air-conditioner system. (i) Checking out a trouble (ii) Air-conditioner trouble - diagnosis chart 3.5 Checking the refrigeration system. (i) Checking system with sight glass (ii) Using the Leak detector (iii) Checking pressures with the gauge set
<b>Unit– IV SERVICIN G OF VEHICLE AIR CONDITIO NING SYSTEMS.</b>	4a.Explain Maintenance & service of various components of air-conditioner system. 4b.Explain Charging & Discharging of air- conditioner system.	4.1 Air-conditioner maintenance and service. (i) Periodic maintenance (ii) Vacuum pump service (iii) Discharging the system (iv) Adding oil (v) Evacuating the system (vi) Vapour charging and Liquid charging Methods. (vii) Use of Recovery recharging unit. 4.2 Different types of air-conditioner service. 4.3 Removing and replacing components. (i) O - rings (ii) Hose clamps (iii) Compressor drive belts (iv) Removing and replacing the compressor (v) Removing and replacing other components 4.4 Servicing Air-conditioner compressors. (i) Servicing different types compressors (R-4, R-6, V-type etc.)

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – 42 Hours)			
			R Level	U Level	A Level	Total
I.	Vehicle air-conditioning fundamentals.	13	11	10	0	21
II.	Vehicle air-conditioning heater systems.	09	07	07	0	14
III.	Heater and air-conditioner trouble shooting.	10	0	05	12	17
IV.	Servicing of vehicle air conditioning systems.	10	0	05	13	18
	<b>Total</b>	<b>42</b>	<b>18</b>	<b>27</b>	<b>25</b>	<b>70</b>

### Legends:

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

## 7. SUGGESTED LIST OF EXPERIMENTS

The tutorial/practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills (**Outcomes in cognitive, psychomotor and affective domain**) so that students are able to acquire the competencies.

Sr. No.	Unit No.	Practical Exercises (Any Seven) (Outcomes' in Psychomotor Domain)	Hours (Total 28 hrs)
1	III	Test the Air Conditioning System for refrigerant leaks.	4
2	IV	Perform Evacuation of the Air-conditioner system	4
3	IV	Perform Recharging the Air-conditioner system	4
4	IV	Perform Air Conditioning system Recharging with Recovery unit.	4
5	III	Trouble shooting the Air-conditioner system	4
6	IV	Service Air-conditioner	4
7	I	Service Air-conditioner compressors	4
8	II	Service Heating systems	4

## 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. SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- i. Case studies of typical maintenance/installation problems in ACs for different makes of automobiles and problem based learning
- ii. Arrange expert lectures of executives of different vehicle ACs companies
- iii. Visit of authorized workshop of four wheelers.
- iv. Collection of animation or video clips and presentation using same.
- v. Internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects etc.

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

S.No.	Author	Title of Books	Publication
1	Anil Chhikara	Automobile Engineering (Volume – VI)	Satya Prakashan.
2	William H. Carouse & Donald L. Anglin	Automotive Air-conditioning	Tata McGraw-Hill Co., Ltd., New Delhi
3	Clifford L.Samuels	Automotive Air-conditioning -	Prentice Hall Int.
4	Steven Daly	Automotive Air-conditioning & Climate control system.	Butterworth-Heinemann
5	Mark Schnubel	Automotive heating and air conditioning	Cengage Publication

**B. List of Major Equipment/ Instrument**

1. Leak Detector
  - (a) Halide Torch complete set (Propane Cylinder, torch, etc)
  - (b) Electric Leak Detector complete set  
(Detector probe, Amplifier/tester, 12V battery, test liquid, etc)
2. Vacuum pump – Model for demonstration
3. High/Low Pressure (Vacuum) gauge manifold (unit cm of Hg & kg/cm<sup>2</sup>)
4. Refrigerant container
5. Oil Inducer (A Long tube with connectors at ends and with a Manual valve)
6. Magnetic clutch – Model for demonstration
7. Expansion valve – Model for demonstration
8. Compressor – cut section for demonstration
9. Evaporator Pressure regulator Valve – for demonstration
10. Car Heater Blower Motor and wheel assembly – for demonstration.
11. V.C.R. Cycle – Model for Demonstration
12. Evaporator – Cut section model for demonstration
13. Air conditioning Recovery Recharging Unit

### C. List of Software/Learning Websites

Sample Video for Practical:

Sr No.	Topic	Sample Video URL Address	
1	How To Find and Repair AC Leaks EricTheCarGuy	<1>	<a href="https://www.youtube.com/watch?v=e31HCvckZAU">https://www.youtube.com/watch?v=e31HCvckZAU</a>
		<2>	<a href="http://youtu.be/e31HCvckZAU">http://youtu.be/e31HCvckZAU</a>
2	How To Recharge an AC System EricTheCarGuy	<1>	<a href="https://www.youtube.com/watch?v=IN55uStu8Xs">https://www.youtube.com/watch?v=IN55uStu8Xs</a>
		<2>	<a href="http://youtu.be/IN55uStu8Xs">http://youtu.be/IN55uStu8Xs</a>
3	Using AC Pressure Gauges To Fix Car AC Problems	<1>	<a href="https://www.youtube.com/watch?v=PdQGS6mJjQ8">https://www.youtube.com/watch?v=PdQGS6mJjQ8</a>
		<2>	<a href="http://youtu.be/PdQGS6mJjQ8">http://youtu.be/PdQGS6mJjQ8</a>
4	Quick automotive a c system leak detection using uv dye	<1>	<a href="https://www.youtube.com/watch?v=1-R8k0Rf76M">https://www.youtube.com/watch?v=1-R8k0Rf76M</a>
		<2>	<a href="http://youtu.be/1-R8k0Rf76M">http://youtu.be/1-R8k0Rf76M</a>
5	How to Troubleshoot your Car's AC System NBC Consumer Watch Advance Auto Parts	<1>	<a href="https://www.youtube.com/watch?v=QsxzcoYFWTk">https://www.youtube.com/watch?v=QsxzcoYFWTk</a>
		<2>	<a href="http://youtu.be/QsxzcoYFWTk">http://youtu.be/QsxzcoYFWTk</a>
6	How to Recharge an Auto A C System Removing Connecting Refrigerant Cans to a Car	<1>	<a href="https://www.youtube.com/watch?v=orflU-cvxco">https://www.youtube.com/watch?v=orflU-cvxco</a>
		<2>	<a href="http://youtu.be/orflU-cvxco">http://youtu.be/orflU-cvxco</a>
7	How to test for refrigerant leaks	<1>	<a href="https://www.youtube.com/watch?v=2XjAZjqSC-k">https://www.youtube.com/watch?v=2XjAZjqSC-k</a>
		<2>	<a href="http://youtu.be/2XjAZjqSC-k">http://youtu.be/2XjAZjqSC-k</a>
8	How to pull vacuum on an R134a car AC system	<1>	<a href="https://www.youtube.com/watch?v=FiHr5V04dnc">https://www.youtube.com/watch?v=FiHr5V04dnc</a>
		<2>	<a href="http://youtu.be/FiHr5V04dnc">http://youtu.be/FiHr5V04dnc</a>
9	How to evacuate and pull vacuum on an R134a car AC system	<1>	<a href="https://www.youtube.com/watch?v=8Yom2jLiKGA">https://www.youtube.com/watch?v=8Yom2jLiKGA</a>
		<2>	<a href="http://youtu.be/8Yom2jLiKGA">http://youtu.be/8Yom2jLiKGA</a>
10	Evacuate vacuum down your Auto AC system w inexpensive tools	<1>	<a href="https://www.youtube.com/watch?v=8kTyLkcu0dA">https://www.youtube.com/watch?v=8kTyLkcu0dA</a>
		<2>	<a href="http://youtu.be/8kTyLkcu0dA">http://youtu.be/8kTyLkcu0dA</a>
11	Air Conditioning Troubleshooting	<1>	<a href="https://www.youtube.com/watch?v=WncHNLdU4EA">https://www.youtube.com/watch?v=WncHNLdU4EA</a>
		<2>	<a href="http://youtu.be/WncHNLdU4EA">http://youtu.be/WncHNLdU4EA</a>
12	A C Troubleshootingpart 2of 2	<1>	<a href="https://www.youtube.com/watch?v=tcQ3HVVHXm4">https://www.youtube.com/watch?v=tcQ3HVVHXm4</a>
		<2>	<a href="http://youtu.be/tcQ3HVVHXm4">http://youtu.be/tcQ3HVVHXm4</a>
13	A C Troubleshootingpart 1of 2	<1>	<a href="https://www.youtube.com/watch?v=15oqzuFNHx4">https://www.youtube.com/watch?v=15oqzuFNHx4</a>
		<2>	<a href="http://youtu.be/15oqzuFNHx4">http://youtu.be/15oqzuFNHx4</a>
OR Complete Video Play-list available on below single URL address			
<a href="http://www.youtube.com/playlist?list=PLssHEXVflgpF63EPqNhDZhNGewONk8UGs">http://www.youtube.com/playlist?list=PLssHEXVflgpF63EPqNhDZhNGewONk8UGs</a>			

### 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

#### Faculty Members from Polytechnics

- Mr.D.A.Dave, H.O.D., Automobile Engg. , Sir Bhavsinhji Polytechnic Inst., Bhavnagar.
- Mrs.M.N.Vibhakar, Lecturer, Automobile Engg. DR.S&SS Gandhi Polytechnic, Surat
- Mr.A.K.Nanavati, Lecturer, Automobile Engg. G.P., Ahmadabad
- Mr.V.B.Patel, Lecturer, Automobile Engg. Dr. J.N.Mehta Government Polytechnic, Amreli

#### 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

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM  
COURSE TITLE: MOTOR VEHICLE ACTS AND LOSS ASSESSMENT  
(COURSE CODE:3360205)**

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

**1. RATIONALE**

Now days different models of vehicles are launched by many companies in the Indian markets and the vehicle population is increasing day by day. Because of this number of cases of accidents and complexities in insurance settlements are also increasing. In this situation there are opportunities for automobile engineers to work as valuer/assessor for different insurance companies for assessing the loss to the vehicle and settling the claims. Looking to this, the course is designed to provide the students understanding of the provisions regarding traffic control and offences, different types of insurance policies and procedure for settlement of claims related to accidents. This course will also make the students more equipped with the assessment of vehicle losses.

**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:

- **Apply knowledge of Motor vehicle acts, insurance policy and procedure for claims to be settled against accidents.**

**3. COURSE OUTCOMES**

Students will be able to:

- Describe motor vehicle acts.
- Describe general provision regarding maintenance of motor vehicle for safety & pollution control.
- Use guide lines for different offences & penalty procedure for traffic control.
- Describe different provisions of motor insurance.
- Analyse effect of impact on accidental vehicle.
- Use claim procedure for assessing various losses of accidental vehicle.

**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>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>70</b>	<b>30</b>	<b>00</b>	<b>00</b>	<b>100</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 (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I PRELIMINARY ABOUT TRANSPORT AUTHORITIES	1a. Describe basic Functions of transport authorities. 1b. Explain anatomy of different vehicles. 1c. Describe procedure to obtain the permit.	1.1 Functions of Transport authorities 1.2 The key terms used in the motor vehicle act 1.3 The classification and anatomy of different types of vehicle like Two wheelers, Three wheelers, Four wheelers, Multi wheelers, Imported vehicles and miscellaneous vehicle 1.4 The necessity of permit 1.5 The provision regarding the permit and forms used for granting permit 1.6 Special provision relating to State Transportation Undertaking.
Unit– II CONSTRUCTION EQUIPMENT AND MAINTENANCE OF MOTOR VEHICLE	2a. Describe general provision regarding maintenance of motor vehicle for safety & pollution control.	2.1 General provisions regarding construction and maintenance of motor vehicle 2.2 Provisions regarding : Lamps, Brakes, Horn, Silencer, Mirror, Safety glass, Wind screen wiper, Tyres, Speedometer, Steering, Springing, Direction indicator and stop light, First Aid Box, Emission of smoke, vapour and grit, For attaching side-car to a motor-cycle
Unit– III OFFENCES AND PENALTY PROCEDURE FOR TRAFFIC CONTROL	3a. Describe various provisions regarding traffic control. 3b. Describe the guide lines for different offences & provision for the punishment of offences. 3c. Explain the procedure for penalty regarding offences.	3.1 Limits of Speed and loading limit of vehicle with respect to power to weight ratio 3.2 Provisions regarding vehicle with Left-hand control 3.3 The duties of driver and owner. 3.4 The provisions regarding (i) Motor vehicle temporarily leaving or visiting India. (ii) Payment of compensation on the principle of no fault. (iii) Punishment of offences. (iv) Disobedience, obstruction and refusal of information (v) Allowing driving of vehicle by unauthorized person (vi) Offences relating to Licences (vii) Using the vehicle without registration of permit (viii) Driving the vehicle exceeding



Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
		permissible weight (ix) Driving the uninsured vehicle (x) Power to detain the vehicles used without certificate of registration of permit 3.5 Guide Line for following offences such as : (i) Driving recklessly or dangerously (ii) Driving while under the influence of drink or drugs (iii) Taking part in unauthorized race or trial of speed (iv) Driving when disqualified (v) Obtaining or applying for a licence without giving particulars of endorsement (vi) Failing to stop on the occurrence of accident
Unit– IV TYPES OF VEHICLE INSURANCE.	4a. Describe different types of insurance covered in motor vehicles.	4.1 Origin, history and development of insurance. 4.2 Act liability only 4.3 Third party only. 4.4 Comprehensive policy. 4.5 Policies with Zero Depreciation Option 4.6 Policy term and condition.
Unit– V VEHICLE IMPACT ANALYSIS.	5a. Analyse effect of impact on accidental vehicle.	5.1 Causes of accidents. 5.2 Effect of Impact from any one side 5.3 Head on collision. 5.4 Vehicle topples. 5.5 Failure of vehicle.
Unit– VI INSURANCE SURVEY AND INVESTIGATION OF CLAIM	6a. Describe role of surveyor and loss adjustor. 6b. Explain Claim procedure of various loss assessments.	6.1 Role of surveyor and loss adjustor. 6.2 Licensing authority and controller of insurance. 6.3 Empanelment of surveyor. 6.4 Claim Procedure Intimation, Site visit, Garage visit, Checking of documents (Paper pertaining related to claim), Photography, Estimate and claim form, Passing of estimate (i) Cost of parts (ii) Cost of repairing (iii) Labour, Preparation of survey reports and submission 6.5 Various types of loss assessment. 6.6 Important aspects of survey 6.7 Fraud claims 6.8 Connected to MACT

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks (Duration – 42 Hours)			
			R Level	U Level	A Level	Total
I.	Preliminary about transport authorities	06	00	04	06	10
II.	Construction equipment and maintenance of motor vehicle	06	04	06	00	10
III.	Control of traffic offences, penalty & procedure	10	04	04	08	16
IV.	Types of insurance	06	02	02	06	10
V.	Vehicle Impact analysis	04	02	02	04	08
VI.	Insurance survey and investigations of claims	10	04	04	08	16
	Total	42	15	22	33	70

**Legends:**

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

**7. SUGGESTED LIST OF EXPERIMENTS**

(No laboratory experiments in the teaching scheme.)

**8. SUGGESTED LIST OF STUDENT ACTIVITIES**

Following is the list of proposed student activities like:

- i. Seminar by Students on a given topic
- ii. Prepare survey report of accidental Vehicle(two wheeler, three wheeler, four wheeler)
- iii. Fill up various types of forms/formats
- iv. Write assignments (classroom, library, home)
- v. Report writing on claim procedure

**9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- i. Arrange visit at R.T.O., any Insurance company, authorized workshop
- ii. Case study on survey report

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

Sr.No	Author	Title of Books	Publication
1	Government of India	Motor vehicles Act, 1989	Government of India
2	Government of Gujarat	The Gujarat Motor vehicles Rules, 1989	Government of Gujarat
3	Government of India	The Central Motor vehicle Rules, 1989	Government of India
4	Universal's Legal Manual	Motor Vehicle Laws (Act and regulation) ISBN- 978-81-7534-936-0	Universal Law Publishing Co. Pvt Ltd
5	Dr. L.P.Gupta	Insurance claims solutions ISBN- 978-9383303038	Dr. L P Gupta
6	Rudolf Limpert	Motor vehicle Accident Reconstruction & Cause Analysis 7 <sup>th</sup> addition	Lexis Nexis Publication

**B. List of Major Equipment/ Instrument Not Required****C. List of Software/Learning Websites**

Sr. No.	Topic	URL Address
1	Auto Insurance Claims Process	<a href="http://youtu.be/J-vrjgKqqSQ">http://youtu.be/J-vrjgKqqSQ</a>
2	Car Crash Compilation # 359 August 2014 - Sample Accident Videos	<a href="http://youtu.be/vJVrFjzNj3w">http://youtu.be/vJVrFjzNj3w</a>
3	Claims Video	<a href="http://youtu.be/JRDN6hwCIjs">http://youtu.be/JRDN6hwCIjs</a>
Or Complete Playlist in one URL <a href="https://www.youtube.com/playlist?list=PLPvqVA0h0J6gqQc2XkNjYzaCwbimt4aaA">https://www.youtube.com/playlist?list=PLPvqVA0h0J6gqQc2XkNjYzaCwbimt4aaA</a>		
<b>Rules</b>		
1	Central Motor Vehicle Rules1989.pdf	<a href="https://drive.google.com/folderview?id=0BwlcAhaTpxajdnU4c052WW03TGc&amp;usp=sharing">https://drive.google.com/folderview?id=0BwlcAhaTpxajdnU4c052WW03TGc&amp;usp=sharing</a>
2	Gujarat Motor Vehicle RULES_1989.pdf	
3	THE MOTOR VEHICLES ACT, 1988.pdf	

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

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- Mrs.M.N.Vibhakar, Lecturer, Automobile Dept. DR.S&SS Gandhi Polytechnic, Surat
- Mr.D.J.Gohel, Lecturer, Automobile Dept., C.U.Shah Polytechnic, Surendranagar
- Mr.V.B.Patel, Lecturer, Automobile Engg. Dr. J.N.Mehta Government Polytechnic, Amreli

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**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM  
COURSE TITLE: TECHNICAL SEMINAR  
COURSE CODE:3360206)**

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

**1. RATIONALE**

In the present world of fast growing knowledge, automobile sector is no different. Every year new models of the vehicles are being launched with new technologies and features. In this scenario, automobile engineers should have ability to search and learn on their own about emerging technologies. It is necessary so that they may continue to learn while on the job, even when there are no teachers to guide them. To develop these abilities of self learning in students, this course is kept in the curriculum. In this course students would choose on their own some topic beyond the curriculum and would search material on this topic by visiting internet/automobile companies and their garage. Based on this collected material they would develop the posters/charts, models, report and presentations. In this course major learning/work would be done by students on their own, and faculty would only guide, support and motivate them. Faculty may also work as facilitator for arranging resources for students. It is hoped that this course would develop knowledge, practical skills, self learning abilities, creativity, presentation skills, team working, leadership & communication skills and overall personality in students. This course will also enable them to gain confidence to face the Placement interviews.

**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:

- **Present scientifically prepared technical paper/charts/models on some emerging technology related to automobiles.**

**3. COURSE OUTCOMES (COs)**

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain so that students are able to

- Gain knowledge of fast and rapid changing automotive technology by self learning.
  - Prepare models/charts/reports based on collected information.
  - Prepare presentation in proper format.
  - Show communication, interpersonal and presenting skills.
- ∇-Handle questions after the presentation with confidence

**4. 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	100
0	0	3	3	00	00	40**	60	

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

\*\*Indicate internal exam for practical.

## 5. COURSE CONTENT DETAILS:

**There is no specific content in this course; however, teachers/students are supposed to follow following guidelines for technical seminar/model making:**

- i. Students will select topics on their own, the topics may be on any aspect of the automotive technology but normally beyond the curriculum.
- ii. Student would organize preliminary presentations before faculty and other students, in which he/she would explain what is the topic or topics? Why they have chosen this? And what are they going to do in it? Based on this presentation guide would approve or help them in finalization of the topic and would give suggestions for further improvement. The presentation by one student/one group and discussion on this presentation would also be learning for other groups.
- iii. Faculty should ensure that though topic is challenging to students, it should be feasible and within capabilities of the group of students.
- iv. It is mandatory that each student will present individually a seminar/model on agreed topic. Student can make working/ demonstrative model and give presentation seminar on it.
- v. In a session of three periods per week, Students are expected to present the progress of seminar/ model to the concerned faculty and take help them if required.
- vi. These three periods per week may also be used by faculty for arranging presentation by each student on a small topic (but different than their main topic) for 5 to 10 minute duration. This would give one more chance to each student for learning and presenting.
- vii. During the final seminar sessions each student (In case of group, max. of 4) is expected to prepare and present a topic on engineering/ technology, for duration of not less than 15 minutes.
- viii. The student has to submit a hard copy of the technical report, in the form of a title page, introduction, body chapters and a conclusion with references, running to not less than 20 pages; this will be evaluated by the faculty coordinator/guide. Original references are highly valued.
- ix. At end of the semester students would have to submit the posters/charts/ model/presentations.
- x. For every group of students a faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance.
- xi. Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

## 6. SPECIFICATION TABLE:

**There is no particular specification table for assessment; however, faculty should follow following guidelines for assessment:**

### **Progressive Assessment:**

The progressive assessment would be carried out based on following criteria.

- i. Innovativeness of the topic
- ii. Initiative and efforts taken in searching the topic

- iii. Amount and quality of material collected related to topic by searching library/internet/automobile companies etc.
- iv. Creativity and innovativeness in preparing models/charts etc.
- v. Planning the activities and then pursuing that plan.
- vi. Persistence in the efforts and resourcefulness.
- vii. Team working as member of team and leader.
- viii. Communication skills.
- ix. Sharing of the load within the group.
- x. Timely achievement of the targets.

### **End of the Term Assessment:**

**50% Marks would be allocated to report/model/charts.** The criteria for their evaluation would be as below:

- i. Amount of work involved/amount of individual's contribution in it.
- ii. Complexity of work
- iii. Novelty of the work
- iv. Neatness and clarity in work
- v. In case of charts the quality of sketch/diagrams/graphs/tables etc.
- vi. In case of models the type of materials and fabrication methods used for making it.  
Amount of work done by students as compared to use of directly purchased components (fabrication from market should be discouraged/penalised)
- vii. In case of reports language, originality (cut and paste should not be allowed/penalised), organisation and presentation of material, quality of diagrams/drawings, number and quality of references.

**Note: Student's efforts rather than only quality of work should be the basis of giving marks. It may happen that one group of students have fabricated model on their own and this model may not have good finish or might not be fully complete, but this group should get more marks as compared to the group who have finished model but most of the work has been got done from market.**

### **50% Marks would be allocated to presentation.**

The assessment criteria would be as below:

- i. Quality of slides/transparency prepared
- ii. Organisation and sequencing of the content
- iii. Quality of content.
- iv. Confidence level and communication during presentation
- v. Handling of questions after presentation

**Note: -\*It is Compulsory to upload three best PPT Presentation Institute wise during online mark entry of this subject.**

## **7. SUGGESTED LIST OF PRACTICAL/EXERCISES**

Not required.

## **8. SUGGESTED LIST OF STUDENT ACTIVITIES**

Following is the list of proposed student activities for this course:

- i. Search internet/library/Automobile Manufacturers/Garages
- ii. Identify a topic related to the curriculum but beyond curriculum
- iii. Collect as much information as possible for selected topic.
- iv. Prepare charts on this topic and related topics.



- v. Prepare models for various automotive components related to topic.
- vi. Demonstrate use of latest technology in topics selected.
- vii. Prepare a detailed report on work done
- viii. Prepare presentation for 15 minute duration and present it in front of students and faculty.

## 9. SPECIAL INSTRUCTIONAL STRATEGIES (If any):

- (i) In this course students should be allowed and encouraged do maximum things on their own so that they develop self directed learning skills.
- (ii) Faculty should only regularly monitor the progress and help students only if they are stuck. For this faculty should allow students to struggle and should not spoon feed them but at the same time should have a close watch on them to ensure that they are working on their own.
- (iii) Faculty should help students if required in arranging resources from different departments of the institute and from other institutes/ organisations
- (iii) Faculty should also keep an eye on the group dynamics and short out if there is any major problem in some group/groups.
- (iv) Faculty should warn the group at different stages if they are not progressing well as per their plan, and if necessary this warning may be issued in writing to students to make them understand the importance of it and for making records for justifying giving less marks to them if they are not able to perform well by the end of the term.

## 10. SUGGESTED LEARNING RESOURCES

- (i) Access to Library books/internet should be ensured
- (ii) For project work faculty may liaison with the other institutes/organizations and automobile companies in the city for providing access to students to their libraries and learning resources.
- (iii) Faculty should also liaison with other departments/institutes and automobile companies for providing access to students to their workshops/machines for fabrication of models/projects.

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### Faculty Members from Polytechnics

- **Prof. M.J. Pathak**, H.O.D., Auto.Dept. Sir Bhavsinhji Polytechnic Inst., Bhavnagar.
- **Prof. A.K. Nanavati**, Lecturer, Automobile Engg. G.P., Ahmadabad.
- **Prof. A.C. Suthar**, Lecturer, Automobile Dept. MLID Polytechnic, Bhandu
- **Prof. Sulay Patel**, H.O.D., Auto.Dept. L.J. Polytechnic, Ahmadabad.

### Coordinator and Faculty Members from NITTTR Bhopal

- **Dr Shashi Kant Gupta**, Professor and Coordinator for state of Gujarat.
- **Dr. K. K. Jain**, Professor, Department of Mechanical Engineering