

**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