



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Automobile Engineering

Subject Code: DI04002021

Subject Name: Maintenance & Service - II

w. e. f. Academic Year:	2025-26
Semester:	4 th
Category of the Course:	PCC

Prerequisite:	-
Rationale:	The Maintenance and Service-II course helps students learn how to troubleshoot, repair, and maintain vehicle transmission systems. Educating students about maintenance practices ensures that transmission components are regularly checked, preventing potential failures and enhancing overall vehicle safety and reliability. Proper knowledge of maintenance prevents failures, reduces accidents, saves repair costs, and improves fuel efficiency with lower emissions. The course also prepares students for jobs in service centers, workshops, and for starting their own automotive repair business. Learning will be through theory, hands-on practice, and practical demonstrations, so students can apply their knowledge effectively in real situations.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Troubleshoot clutch and fluid coupling systems by applying appropriate diagnostic tools and standard procedures.	R, U & A
02	Rectify gearbox and automatic transmission system using specialized tools and equipment.	R, U & A
03	Overhaul propeller shaft, differential, universal joint, slip joints and axles using appropriate tools, equipment and diagnostic techniques.	R, U & A
04	Restore steering system suspension system and chassis using appropriate tools, equipment and diagnostic techniques.	R, U & A
05	Maintain braking system, wheels and tyre using appropriate tools, equipment and diagnostic techniques.	R, U & A

*Revised Bloom's Taxonomy (RBT)



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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE(E)	PA(M)	PA(I)	ESE(V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	<p>Trouble shooting of Clutch and Fluid coupling</p> <p>1.1 Problem Identification in clutch engagement and disengagement, clutch pedal linkages and clutch release mechanism and corrective actions.</p> <p>1.2 Troubles and their remedial measures for clutch unit on the basis of feel and noise such as clutch drag, clutch pedal pulsation, clutch judder, clutch chatters, clutch linkages vibration and noisy, clutch stiff and clutch slip with their causes and remedial actions.</p> <p>1.3 Inspection of clutch components like release bearing, flywheel, pressure plate and clutch plate for wear, tear, scoring and chatters according to various problems.</p> <p>1.4 Testing of clutch components like Pressure plate warpage test, clutch plate and flywheel run-out measurement and reconditioning steps.</p> <p>1.5 Different types of Clutch adjustments with free play adjustment.</p> <p>1.6 Trouble shooting in fluid coupling such as slip/drag, fluid leakage and low fluid level with its causes and remedial actions.</p>	9	20%
2.	<p>Trouble shooting of Gearbox and Transmission system components</p> <p>2.1 Various troubles in Gearbox like hard shifting, Gear slipping, Noisy gear engagement, grinding noises during gear changes and oil leakages with their causes and remedial actions.</p> <p>2.2 Various troubles in Automatic transmission such as Low or leaking fluid, Gears slipping and various noises with their causes and remedial actions.</p>	9	20%



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	<p>2.3 Identify various troubles in Torque Converter such as lock-up, overheating and unusual noises with their causes and remedial actions. Stall test of torque converter.</p> <p>2.4 Maintenance and servicing:</p> <p>2.4.1 Fluid Inspection and Change</p> <p>2.4.2 Identifying and replacing worn or leaking seals.</p> <p>2.4.3 Checking for worn or damaged bearings in the transmission.</p> <p>2.4.4 Visual inspection of gears and synchronizers for wear or damage.</p> <p>2.4.5 Lubricating and adjusting the gear linkage for smooth operation.</p> <p>2.4.6 Servicing and maintenance of automatic transmission.</p> <p>2.4.7 Environmental Impact: Proper disposal of transmission fluids and components.</p>		
3.	<p>Trouble shooting of Driveline and Axles (Front & Rear Axles)</p> <p>3.1 Various troubles in Propeller shaft and universal joints such as vibration, noise and misalignment with their probable causes and remedial actions.</p> <p>3.2 Differential problems on the basis of abnormal noise and vibration, fluid leakage and differential locking.</p> <p>3.3 Various troubles in front axle and rear axle assembly with its probable causes and remedial actions.</p> <p>3.4 Inspection, servicing and reconditioning of front axle assembly.</p> <p>3.5 Inspection, servicing and reconditioning of rear axle assembly.</p>	9	20%
4.	<p>Trouble shooting of Steering system, Suspensions and chassis</p> <p>4.1 Various troubles in steering system (Power steering systems) with its probable causes and remedial actions.</p> <p>4.2 Inspection, servicing and reconditioning of steering systems and steering gearbox according to problems.</p> <p>4.3 Wheel alignment procedure.</p> <p>4.4 Various troubles indifferent types of suspension systems like shock absorber, leaf spring, independent suspension and air suspension with its probable causes and remedial actions</p> <p>4.5 Inspection and overhauling of suspension systems according to problems.</p> <p>4.6 Chassis greasing procedure using grease gun.</p>	9	20%



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5.	<p>Trouble shooting of Brakes & Service of Wheels and Tyres</p> <p>5.1 Drum brake troubleshooting such as Brake pedal goes to the floor, one brake drags, all brake drags, pulls to one side when braking, Soft or spongy pedal, Poor braking required excessive pedal force, Brakes grab, Noisy brakes, Loss of brake fluid, Brakes do not self-adjust, Brake warning light while braking.</p> <p>5.2 Disc brake troubleshooting such as Excessive pedal travel, Pedal pulsations Excessive pedal. force, grabbing, uneven braking, pulls to one side while braking, Brake noise, Brake fails to release, Fluid leaking from caliper, Front disc caliper grab, No braking with pedal fully depressed, fluid level low in master cylinder.</p> <p>5.3 Troubleshooting of Air braking system and ABS.</p> <p>5.4 Air bleeding procedure for brakes and Brake performance test</p> <p>5.5 Troubleshooting of Disc Wheels, Alloy wheels and Tyres.</p> <p>5.6 Important Procedures for,</p> <p style="margin-left: 20px;">a. Inspection of Wheel Rim and Tyres</p> <p style="margin-left: 20px;">b. Tyre Retreading procedure</p> <p style="margin-left: 20px;">c. Wheel balancing procedure</p>	9	20%
Total		45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
20	40	40	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1	Automobile Mechanics	William Crouse	Tata Mc-Graw Hill Publication, Noida, UP, India (2017) ISBN-13: 9780070634350



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2	Automotive Technology	James Halderman and Curt Ward	Pearson Publication (7 th edition) ISBN-10: 0-13-785490-0 ISBN-13: 978-0-13-785490-5
3	Vehicle Maintenance and Garage Practice	Jigar A. Doshi, Dhruv U. Panchal, et al.	PHI Learning, Delhi, India (2014) ISBN: 9788120349827
4	Automobile Engineering	R. B. Gupta	Satya Prakashan, New Delhi (2016) ISBN: 9788176848589, 8176848581
5	Maintenance Engineering and Management	R. C. Mishra, K. Pathak	PHI Learning Pvt. Ltd., Delhi, India (2004) ISBN: 9788120345737
6	Automobile Engineering, Vol.1, (Chassis and Body)	Dr. Kirpal Singh	Standard Publishers Distributors, India (2007) ISBN: 8180140997
7	Automotive Technology	N. K. Giri	Khanna Publication Co. (P) Ltd., Delhi, India (2004) ISBN: 8174092161
8	Automobile Engineering	C. P. Nakra	Dhanpat Rai Publication Co. (P) Ltd., Delhi, India (2023) ISBN-10: 9352168828 ISBN-13: 978-9352168828

(b) Open-source software and website:

- <https://www.howacarworks.com>
- <https://swayam.gov.in>
- <https://auto.howstuffworks.com>
- <https://nptel.ac.in/courses>

Suggested Course Practical List:

Sr. No	Practical Outcomes (PrOs)		Unit No.	Approx. Hrs. required
1	Perform Inspection procedure of clutch components for wear, misalignment, damage with the help of diagnostic tool and carry out corrective measures.	Any one	I	04
2	Check fluid coupling for lubrication and alignment and carry out corrective measures.		I	04



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3	Carry out routine maintenance, inspection and servicing of Manual gearbox.	Any one	II	04
4	Carry out routine maintenance, inspection and servicing of Automatic Transmission.		II	04
5	Carry out inspection and servicing of final drive.		III	04
6	Carry out inspection and servicing of Power steering system.	Any one	IV	04
7	Carry out inspection and servicing of suspension system.		IV	04
8	Carry out Wheel alignment.		IV	04
9	Carry out inspection and servicing of braking system (Any One-Mechanical or Hydraulics or Pneumatic)		IV	06
10	Perform Bleeding Procedure of Hydraulic Brakes.	Any one	IV	04
11	Carry out tyre rotation process and wheel balancing.		V	04
	Total Hrs.			30

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications	PrO. No.
1	Dial Gauge, feeler gauge and straight edge gauge, clutch aligner, Bearing puller, different types of hand tools and power tools.	All
2	Hydraulic Jack (2 Tons Capacity) with 4-Stands 1.5 Tons Capacity	All
3	Hydraulic Two Post Car Lift □ Max Load : 2- 4 Tons □ Locking System : Automatic □ Phase Type : Single Phase □ Lifting Time : 41- 50 Sec □ Max. lifting height: 1830 mm	All
4	Different types Clutch unit component assembly like Single plate, multiplate and centrifugal clutch with actuating mechanisms.	1
5	Fluid coupling assembly and its components.	2
6	Working model of different types of gear box units (sliding mesh, constant mesh, synchromesh gearboxes) with actuating mechanism.	3
7	Working model of different types of Automatic gear box Units (CVT, AMT and DCT / DS)	4
8	Working model of Rear axle with differential unit and final drive.	5
9	Working Model of power steering mechanism (Hydraulic and Electric assisted)	6



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10	Working model of various suspension systems like leaf spring, shock absorber, independent suspension and air suspension.	7
11	<ul style="list-style-type: none"> • Wheel alignment unit. Technical Specifications: • Toe = ± 20 • Camber = ± 10 • Caster = ± 30 • Setback = ± 20 • Thrust Angle = ± 10 • Power Supply = 230Volt • Power Consumption = 0.4kw • Intelligent Round Moving guided led. • No electronic components and sensor. • No periodic calibration with one. • High precision wheel alignment 3D. • Low-cost maintenance with lower failure rate. • Parking Assistant. • Unique High-resolution targets. • High resolution camera. • User friendly software and quick alignment. • Standard 10" to 24" wheel clamps • Automatic steering angle Measurement without expensive electronic turn tables • Mounting kit for clamps and targets. • Platinum Software • Cabinet with 32" Led 	8
12	Working model of various braking systems like Hydraulic and pneumatic.	9,10
13	<p>Automatic Tyre Charger Machine</p> <ul style="list-style-type: none"> • Motor Power 1.1kW • Air Requirement 8 – 10 bar • Internal Rim Clamping 12"- 23" • External Rim Clamping 10"- 20" • Bead Breaker Tire Width 3"- 15" • Maximum Tire Diameter 41" • Power Supply Single Phase 	11



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14	<p>Automatic Wheel Balancing machine</p> <ul style="list-style-type: none">• Type of Vehicle: Cars• Usage/Application: wheel balancing of Cars, bikes• Rim Width: 1.5 -20"• Motor Power: 0.25kw• Power Supply: 220V• Rim Diameter: 10"-24"• Automation Grade: Automatic• Max Wheel Diameter 24"• <input type="checkbox"/> Type Video-graphic	11
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Suggested Project List:

- 1) Prepare a chart showing troubleshooting of clutch.
- 2) Prepare a display of different worn or damaged parts of clutch.
- 3) Prepared a chart of Trouble shooting in fluid coupling
- 4) Prepare a chart showing troubleshooting of manual Gear box and automatic gear box.
- 5) Prepare a chart on different Gear tooth wear pattern with its symptoms
- 6) Prepare a display of different worn or damaged parts of manual gearbox and automatic transmission with its actuating mechanism
- 7) Prepare chart of trouble shooting of drivelines and axles
- 8) Prepare a model of rear axles and differential unit for wear and run out measurement
- 9) Prepare chart of trouble shooting of Steering Systems (Hydraulics and Pneumatics)
- 10) Prepare a display of different worn or damaged parts of steering linkages and steering gearbox
- 11) Prepare chart of trouble shooting of Various Suspension system (leaf springs, independent suspension, air suspension)
- 12) Prepare chart on various wheel alignment machine with its specification
- 13) Prepare chart on various chassis lubrication points and its lubrication procedure
- 14) Prepare chart on trouble shooting of various braking systems (Mechanical, hydraulic and pneumatic)



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- 15) Prepare a display prototype model of bleeding procedure of hydraulics brake
- 16) Prepare a chart on wheel balancing steps and wheel rotation procedure
- 17) Prepare chart of trouble shooting of wheels and tyres.
- 18) Prepare a chart of tyre retreading procedure.
- 19) Prepare a model of tyres with its different wear condition.

Suggested Activities for Students: If any

Other than the classroom and laboratory learning, following are the suggested student-related *co-curricular* activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of each activity. They should also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- a) Charts can be prepared.
- b) Small report on any topic given by concern faculty.
- c) Small groups of students can be formed for assigned work. Assigned work should be such that it covers market survey, team work, presentation, time management, quality development.

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