

Program Name : Diploma in Automobile Engineering
Program Code : AE
Semester : Sixth
Course Title : Vehicle Systems Maintenance
Course Code : 22065

1. RATIONALE

Vehicle system maintenance is a technology course deals with Automobile workshop, Trouble-shooting, Servicing and Repair of Engine and related systems, Transmission system, Brake system, Steering and Suspension system etc. Prerequisites for this course are Automobile Engines, Advanced Automobile Engines, Automobile Transmission System and Automobile Control Systems which are studied adequately in previous semesters. There is huge opportunity for Diploma Engineers in Automobile Service Sector and Entrepreneurship.

2. COMPETENCY

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- **Maintain automobile engine, transmission, control and comfort systems of vehicles.**

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following **industry oriented** COs associated with the above mentioned competency:

- Use relevant tools and equipment required for maintenance of vehicle.
- Maintain different types of engine systems.
- Troubleshoot major assemblies of transmission system of vehicles.
- Maintain automobile braking, steering and suspension systems.
- Maintain automobile HVAC system.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2	-	4	6	--	--	--	--	--	--	--	75#	30	75~	30	150	60

(#): No theory Exam; (~¹): For the **practical only** courses, the PA has two components under practical marks i.e. the assessment of practicals (seen in section 6) has a weightage of 60% (i.e. 45 marks) and micro-project assessment (seen in section 12) has a weightage of 40% (i.e. 30 marks). This is designed to facilitate attainment of COs holistically, as there is no theory ESE.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit, ESE - End Semester Examination; PA - Progressive Assessment

5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course,



in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

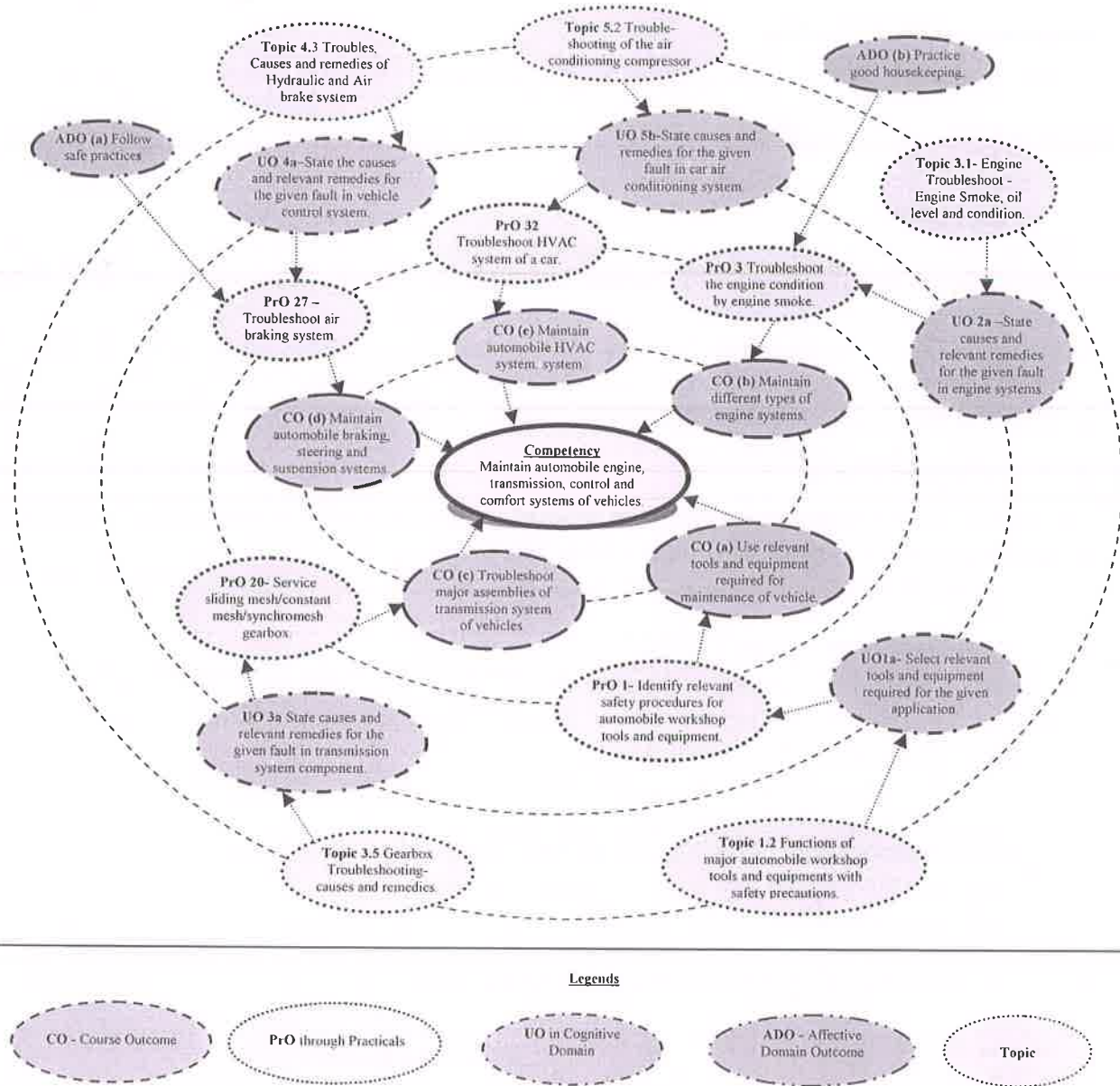
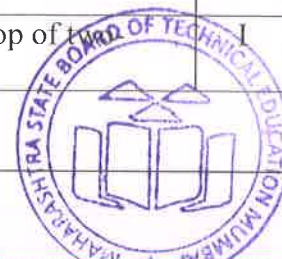


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency.

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1.	Identify relevant safety procedures for automobile workshop tools and equipment- Wheel Aligner, Wheel Balancer, Engine Analyzer, Hydraulic Lift, Air Compressor, Fuel Injector Tester, Engine Compression Tester, Cylinder Bore Gauge, Battery Tester, Pneumatic Gun, Timing Gun.	I	02*
2.	Prepare records maintained in automobile workshop of t wheeler/LMV/HMV.	I	2



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
3.	Troubleshoot the engine condition by engine smoke.	II	2*
4.	Troubleshoot the engine lubrication system.	II	2
5.	Troubleshoot the engine fuel feed system.	II	2
6.	Troubleshoot the engine cooling system.	II	2
7.	Perform the compression test on petrol/diesel engine.	II	2
8.	Service petrol/diesel engine lubrication system.	II	2*
9.	Test mechanical fuel injector for efficient delivery.	II	2*
10.	Perform Calibration and Phasing of Fuel Injection pump of multi-cylinder engine.	II	2
11.	Test the MPFI fuel injector.	II	2
12.	Service engine cooling system.	II	2*
13.	Service Radiator of LMV/HMV.	II	2
14.	Service cylinder head of multi-cylinder petrol/diesel engine.	II	2*
15.	Service cylinder block of multi-cylinder petrol/diesel engine.	II	2*
16.	Service piston and connecting rod assembly of multi-cylinder petrol/diesel engine.	II	2
17.	Service crank shaft and camshaft of multi-cylinder petrol/diesel engine.	II	2
18.	Perform tune-up procedure on petrol/diesel engine.	II	2
19.	Service single plate dry coil spring/diaphragm type clutch assembly with relevant clutch adjustments.	III	2*
20.	Service Sliding mesh/Constant mesh/Synchromesh gearbox.	III	2*
21.	Service Transfer case/gearbox used in 4WD vehicle.	III	2
22.	Service Final drive and differential assembly with relevant adjustments.	III	2*
23.	Service propeller shaft and universal joint assembly.	III	2*
24.	Perform wheel hub greasing.	III	2
25.	Service hydraulic brake system with brake adjustments.	IV	2*
26.	Perform bleeding of hydraulic brakes on vehicle.	IV	2
27.	Troubleshoot air braking system.	IV	2
28.	Perform wheel alignment of vehicle.	IV	2*
29.	Perform wheel balancing of vehicle on balancing machine.	IV	2
30.	Service steering gear box and steering linkages of Car/LMV/HMV.	IV	2*
31.	Service Suspension system of Car/LMV/HMV	IV	2*
32.	Troubleshoot HVAC system of a car for general faults.	V	2*
Total			64

Note

- i. A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 24 or more practicals need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.
- ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:



S. No.	Performance Indicators	Weightage in %
1	Follow safety rules and adopt standard practices for handling tools and equipment's.	30
2	Refer workshop manual and include relevant data in the journal.	20
3	Sketching layouts, components and conclusion.	20
4	Answer to sample questions	20
5	Submit report in time	10
Total		100

The above PrOs also comprise of the following social skills/ attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/ field based experiences:

- a) Follow safety practices.
- b) Practice good housekeeping.
- c) Practice energy conservation.
- d) Work as a leader/a team member.
- e) Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organisation Level' in 2nd year
- 'Characterisation Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	PrO No.
1.	<p>a) Wheel Aligner: Equipped with Variable Height Camera Support, Vehicle Orientation directional Indicator, located on camera beam, Advanced Customer Database, Advanced Alignment Measurements, Custom Vehicle Specifications, Front/Rear/All/Zoom Readings, Individual Camber, Caster & Toe, Initial/Final Print outs in Graphical & Text. Parameter, Range, Accuracy: Camber: $\pm 10^\circ, \pm 2'$; Caster: $\pm 20^\circ, \pm 6'$; Kingpin Inclination: $\pm 20^\circ, \pm 6'$; Toe-in & Toe-out: $\pm 20^\circ, \pm 2'$; Set back: $\pm 5^\circ, \pm 2'$; Thrust angle: $\pm 5^\circ, \pm 2'$.</p> <p>b) Wheel balancer- Max power consumption: 1.1KW, Balancing Speed: <100rpm, Balancing Accuracy: 10g for trucks, Cycle time for wheel: 20sec, Diameter setting range: 10" to 30", Max wheel diameter: 1300mm, Max wheel weight: 250Kg, Max air pressure: 10 bar.</p> <p>c) Engine analyzer: Generic OM123 OBD2 CAN Hand-held Engine Analyzer Code Reader Russian Portuguese Auto Scan Tool Automotive Scanner</p> <p>d) Hydraulic lift- Capacity-2 Ton</p> <p>e) Air Compressor- 1.5H.P, 24 liter, 1300w</p> <p>f) Injector tester – Pressure range-0-60 Mpa, fuel tank volume-1L</p> <p>g) Compression tester- MT-6565</p>	1, 29,31,



S. No.	Equipment Name with Broad Specifications	PrO No.
	h) Cylinder bore gauge - Resolution: 0.01mm, Range: 250-450mm, Depth: 1-250mm i) Battery charger - Input-220-240VAC 50HZ 270W; 220-240VAC 50HZ 350W. Output- 6/12/24V 2/8/4.5A starting current 70A; 6/12/24V 2/10.5/5.5A, starting current 100A j) Pneumatic nut runner -Maximum Torque:10-20 Nm No-Load Speed:10-20 rpm	
2.	Actual Working engine (Multi-cylinder four stroke S.I. and C.I. engines above 1000cc) set up with all accessories.	3-8 & 12-18
3.	Mechanical fuel injector tester: Pressure range 0-60 Mpa, fuel tank volume-1L	9
4.	MPFI fuel injector Testing and cleaning machine: Power supply: AC220V~50/60Hz, AC110V~50/60Hz, Input power: 350W Pressure: 0~6.5bar, Flow test accuracy:±2%, Simulated RPM range: 0~9999 rpm	11
5.	Single plate dry coil spring/diaphragm type clutch of LMV/HMV	19
6.	Light Motor Vehicles: A modern Car and Jeep of any make and model like Maruti, Mahindra, TATA, Force Motors along with all relevant accessories and systems.	All
7.	Sliding mesh/Constant mesh/Synchromesh gearbox of LMV/HMV in good running condition.	20
8.	Final drive and Differential assembly of LMV/HMV in good running condition.	22
9.	Propeller Shaft and Universal joint assembly LMV/HMV in good running condition.	23
10.	Actual working model of Air brake system.	27
11.	Wheel alignment gauges: Combination gauge, toe in - toe out gauge, KPI gauge.	28
12.	Actual steering gear boxes of LMV/HMV in good working condition: Rack and pinion type, Recirculating ball and Nut type, Worm and roller type.	30

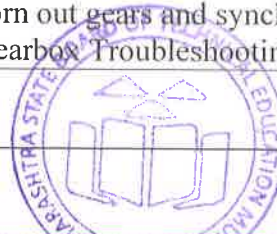
8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added.

Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Automobile workshop tools, equipment and Maintenance management	1a Select relevant tools and equipment required for the given application. 1b Explain the use of the given tool/equipment with justification. 1c Explain the safety precautions to be taken while using the given tool/equipment with justification. 1d Select relevant maintenance procedure for the given	1.1 General safety precautions in automobile workshop. 1.2 Functions of major automobile workshop tools and equipments with safety precautions- wheel aligner, wheel balancer, engine analyzer, hydraulic lift, Compressor, Injector tester, compression tester, cylinder bore gauge, battery tester, pneumatic gun, timing gun. 1.3 Safety procedure for using power tools and equipments (electrically).



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	automobile component. 1e Explain the given type of workshop record with relevant justification.	hydraulically, pneumatically operated) 1.4 Necessity and types of maintenance - Preventive maintenance, Scheduled maintenance, Breakdown maintenance. 1.5 Decision to repair or replace the components during maintenance. 1.6 Record Keeping: Necessity and Types of workshop records - History sheet, Work orders /Job cards, Activity file, Service manual, Spare part register, spares procurement register.
Unit II- Engine Maintenance	2a State causes and relevant remedies for the given fault in the engine systems. 2b Explain with sketch the procedure of engine compression test with justification. 2c Explain the working of the specified fuel injection pump with justification. 2d Describe with sketch servicing of the given engine component. 2e Describe with diagram engine tune up procedure for the given engine.	2.1 Engine Troubleshoot - Engine Smoke, oil level and condition, coolant level and condition, oil pressure testing, compression test, vacuum test, Cylinder Leakage test. 2.2 Lubrication system service: Change oil filter, Check oil pump. Diagnose causes for excessive oil consumption, external oil leakage, and low oil pressure in an engine. 2.3 Fuel feed system service - Injector cleaning and testing, FIP phasing and calibration, MPFI injector testing and cleaning. 2.4 Cooling system servicing - Refilling of radiator, Pressure testing, thermostat checking, Leakage testing, Fan belt tension checking and adjusting. 2.5 Engine Servicing: Checking and servicing of engine components-cylinder head, cylinder block, cylinder liners, piston, piston ring, crank-shaft, Connecting rod, valves, Tuning of engine.
Unit-III Transmission System Maintenance	3a. State causes and relevant remedies for the given fault in transmission system component. 3b. Explain the servicing procedure for the given transmission system component with justification. 3c. Explain with sketch backlash adjustment in the given pair of final drive and differential assembly. 3d. Describe with sketch lubrication of transmission	3.1 Maintenance of Clutch and Gearbox: Checking clutch plate for thickness, run out, rivet depth, torsion spring weakness. Pressure plate for wear, scratches, scoring and warpage, free and seated height of pressure springs, Clutch shaft for bent and distorted splines, Clutch adjustment – types and procedure; Clutch troubleshooting: Causes and remedies for clutch slip, clutch noise, clutch grab and chatter. 3.2 Checking gearbox for run out of main shaft and lay shaft, oil seals, bearings, worn out gears and synchromesh unit. 3.3 Gearbox Troubleshooting- Causes and



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
	system.	<p>remedies for Gear box noise, Hard gear shifting.</p> <p>3.4 Maintenance of propeller shaft and universal joint assembly.</p> <p>3.5 Maintenance of rear axle: Checking and adjusting final drive for ring gear run-out, backlash in ring gear and bevel pinion, tooth contact between ring gear and pinion, backlash in differential gears, Bearing preload –necessity and procedure.</p> <p>3.6 Troubles, Causes and remedies of propeller shaft, differential and rear axle.</p> <p>3.7 Lubrication of transmission system.</p>
Unit –IV Maintenance of Vehicle Control Systems	<p>4a. State the causes and relevant remedies for the given fault in vehicle control system.</p> <p>4b. Explain servicing procedure for brakes of the given vehicle with justification.</p> <p>4c. Describe with sketch wheel alignment/balancing procedure for the given vehicle.</p> <p>4d. Describe the routine maintenance procedure of the given automotive system.</p>	<p>4.1 Maintenance of Brakes- Inspection of master cylinder, wheel cylinder, brake drum, brake linings, brake disc and brake pads. Adjustment of hydraulic brakes – shoe clearance, brake pedal free travel, pedal to floor clearance, parking brake adjustment.</p> <p>4.2 Types of brake bleeding. Procedure for bleeding of hydraulic brakes.</p> <p>4.3 Troubles, Causes and remedies of Hydraulic and Air brake system.</p> <p>4.4 Troubleshooting of suspension system.</p> <p>4.5 Troubleshooting of steering system.</p> <p>4.6 Maintenance of wheels and tyres- Care of wheels and tyres, Procedure of wheel alignment by wheel alignment gauges, Procedure of wheel balancing.</p>
Unit –V Maintenance of HVAC System	<p>5a. Explain safety rules for servicing of the given air conditioner component.</p> <p>5b. State causes and remedies for the given fault in car air conditioning system.</p> <p>5c. Describe with sketch procedure for leakage testing of refrigerant for the given vehicle.</p> <p>5d. Describe the troubleshooting procedure of the given part of the airconditioner.</p>	<p>5.1 Air conditioner service safety rules.</p> <p>5.2 Trouble shooting of the air conditioning Compressor.</p> <p>5.3 Trouble shooting of the air conditioning Blower and condenser.</p> <p>5.4 Trouble shooting of the air conditioning evaporator, valves and filters.</p> <p>5.5 Refrigerant Leakage testing.</p> <p>5.6 Evacuation and charging of air conditioner.</p>

Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.



9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER (INTERNAL DESIGN)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Automobile workshop tools, equipment and Maintenance management	03	2	4	4	10
II	Engine Maintenance	10	2	4	14	20
III	Transmission maintenance	10	2	4	14	20
IV	Maintenance of vehicle control systems	06	2	4	9	15
V	Maintenance of HVAC system	03	2	4	4	10
Total		32	10	20	45	75

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

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 about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Prepare journals based on practical performed in laboratory.
- Give seminar on relevant topic.
- Undertake micro-projects.
- Search latest advanced safety devices used in automobiles and collect their specifications.
- Collect data regarding different tools and equipments used in body repair shop.
- Collect data regarding different tools and equipments used in paint shop.
- Sketch the body shapes as per aerodynamic requirements.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning outcomes in this course:

- Massive open online courses (*MOOCs*) may be used to teach various topics/sub topics.
- 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for *self-directed learning* and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item *activities*.
- Guide student(s) in No.10, teachers need to ensure to create opportunities and provisions for *co-curricular*
- Undertaking micro-projects.



- g) Demonstrate students thoroughly before they start doing the practice.
- h) Encourage students to refer different websites to have deeper understanding of the subject.
- i) Observe continuously and monitor the performance of students in Lab.

12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be *individually* undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- a) **Automobile Workshop Tools and equipment:** Follow the steps given below-
 - i. Identify tools and equipments required for automobile workshop of two wheeler/three wheeler/LMV/HGV dealer, roadside garage and modern workshop for specialized job.
 - ii. Collect specifications of the identified tools and equipment from market/internet.
 - iii. Search the manufacturer/supplier for procurement of above tools and equipment.
 - iv. Prepare the report for procurement of above tools and equipment.
(This fulfills CO-a, CO-b, CO-c, CO-d, CO-e)
- b) **Automobile workshop Layout:** Follow the steps given below-
 - i. Visit to automobile workshop of two wheeler/three wheeler/LMV/HMV dealer, roadside garage and modern workshop for specialized job.
 - ii. Identify the infrastructural facilities, tools and equipment required.
 - iii. Prepare the model of layout for the same.
(This fulfills CO-a CO-b)
- c) **Automobile workshop Records:** Follow the steps given below-
 - i. Visit to automobile workshop of two wheeler/three wheeler/LMV/HMV dealer, roadside garage and modern workshop.
 - ii. Collect workshop records maintained at two wheeler/three wheeler/LMV/HGV dealer's workshop.
 - iii. Observe the inventory control system used in automobile workshop.
 - iv. Prepare the report on record keeping.
(This fulfills CO-a CO-b, CO-c)
- d) **Automobile Lubricants:** Follow the steps given below-
 - i. Collect samples and data of various types of lubricants used in automobiles from Market/Internet.
 - ii. Compare the specifications, properties, applications and cost of above lubricants.
 - iii. Prepare the report.
(This fulfills CO-b, CO-c, CO-d)
- e) Any other micro-projects suggested by course faculty on similar line.



13. SUGGESTED LEARNING RESOURCES :

S. No.	Title of Book	Author	Publication
1	Automotive service	Gills, Tim	Delmar Publisher Inc ISBN-13: 9781401812355
2	Automotive Mechanics	Crouse, William, H; Anglin, Donald L	McGrawhill Education, New Delhi, 2016, ISBN-13: 978-0071125994
3	Automobile Engineering (Vol. III,IV)	Chikara, Anil	Satya Prakashan, New Delhi, 2016 ISBN:13:97881768400774
4	Automotive Engines- Theory and Servicing	Halderman, James, D.	Pearson Education, New Delhi, 2016 ISBN-13:9780133515008
5	Motor Automotive Technology	Schwaller, Anthony	Delmar Publisher Inc. ISBN-13:978-0827351004
6	Automotive Engine Performance	Layne, Ken	Prentice Hall Career Technology ISBN 13:9780471829911
7	Heavy Duty Truck System	Ian, Norman; Robert, Scharff; John, Corinchoke	Delmar Publisher Inc. ISBN-13:978-0766864962
8	Automobile Engineering	Gupta, R.B.	Satya prakashan, New delhi,2011 ISBN-9788176843799

14. SOFTWARE/LEARNING WEBSITES

- a) <https://www.youtube.com/watch?v=LGXfWdAZ0N4> –safety and health in motor vehicle shop
- b) <https://www.youtube.com/watch?v=-mhhDiz3bwk> – workshop tools and equipment
- c) <https://www.youtube.com/watch?v=5Efh-Y35Lcs> – safety procedure for power tools
- d) <https://www.youtube.com/watch?v=Yz-zh3N6AOo>- engine diagnosis
- e) <https://www.youtube.com/watch?v=h7wotCaA6kg>-engine noise
- f) <https://www.youtube.com/watch?v=8q6QP0PmHlg>-cylinder head crack
- g) <https://www.youtube.com/watch?v=O1jwgVhdMso>-automotive diagnostic equipments
- h) <https://www.youtube.com/watch?v=s73JEX6HG78>-engine overheating
- i) <https://www.youtube.com/watch?v=h7-WXFKZiXM>-engine servicing.
- j) <https://www.youtube.com/watch?v=qEyhsk0JTOo>-engine maintenance
- k) https://www.youtube.com/watch?v=0L4f4U_9lcU-change oil and filter.
- l) <https://www.youtube.com/watch?v=wGD0Wm7Smrw>-engine oil consumption.
- m) <https://www.youtube.com/watch?v=32wnnTgCJn8>-injector cleaning and testing
- n) <https://www.youtube.com/watch?v=QUSIEYfx5DM>-mechanical injector testing
- o) https://www.youtube.com/watch?v=_atSLfBIAOI-calibration of FIP
- p) <https://www.youtube.com/watch?v=D69Echdj2EU>-FIP phasing
- q) <https://www.youtube.com/watch?v=osnT0QqGP6I>-cooling system servicing
- r) <https://www.youtube.com/watch?v=3L0p1RGvZqk>-cooling system repair
- s) <https://www.youtube.com/watch?v=OJkFkdBQcGE>-thermostat checking
- t) <https://www.youtube.com/watch?v=-f1eE9U-khU>-fan belt tension checking and adjusting
- u) www.youtube.com/watch?v=iYpzeVNcEG4- cylinder bore inspection
- v) <https://www.youtube.com/watch?v=MHR9MeJKZTs>- inspection of piston and ring
- w) <https://www.youtube.com/watch?v=cQMYO-orBCU>- inspection of connecting rod
- x) <https://www.youtube.com/watch?v=qcWNgd1Vkhk>- tuning of engine
- y) https://www.youtube.com/watch?v=q5M7lbtI1_0- inspection of clutch



- z) <https://www.youtube.com/watch?v=REHQXqzdoa8>- clutch pedal adjustment
- aa) https://www.youtube.com/watch?v=RKp946w-_SQ- gear box inspection
- ab. <https://www.youtube.com/watch?v=YyobS4N8whw>- inspection of differential
- ac. <https://www.youtube.com/watch?v=dAqAqODmcj4>- differential backlash
- ad. <https://www.youtube.com/watch?v=-TspaTqk5Dc>-Brake inspection
- ae. <https://www.youtube.com/watch?v=JePOTERmApw>-brake adjustment
- af. <https://www.youtube.com/watch?v=oponMtCv-BU>-brake bleeding
- ag. <https://www.youtube.com/watch?v=BXTZURC5iQ0>-automotive a.c.diagnosis



