

COURSE DESCRIPTION			
Program	Automobile Engineering		
Course Title	Automobile Service Lab		
Course Code	2059	Semester	II
Type of Course	Lab	Contact Hours	45
Teaching Scheme (L: T:P:R)	0:0:3:0	Credits	1.5
CIE Marks	60	ESE Marks	40

Introduction

Automobile service lab is designed to provide hands-on exposure to fundamental automobile systems and workshop practices. The course enables students to apply theoretical concepts related to IC engines, vehicle systems, lubrication, and cooling systems through structured laboratory experiments. It develops practical competence in, inspection, servicing, and maintenance activities required in automobile workshops.

Course Objectives

1	To develop the ability to identify, compare, and inspect internal combustion engine components and basic engine parameters through laboratory experiments.
2	To demonstrate the assembly, inspection and fitting of engine components such as crankshaft, camshaft, bearings and flywheel using standard workshop practices.
3	To develop the ability to identify and inspect IC engine components, valve mechanisms, and valve timing diagrams through laboratory experiments.
4	To develop skills in inspection and routine maintenance of engine lubrication and cooling systems.

Course Pre-requisite

Topic	Course code	Course Title	Semester
Basic knowledge of Automobile	1051	Basic Automobile Engineering	I

Course Outcome

CO	Course Outcome	Blooms Taxonomy Level
CO1	Apply engineering knowledge to identify, inspect, and analyze IC engine components and fundamental engine parameters through practical experiments.	Apply
CO2	Demonstrate the correct assembly and fitting of moving engine components like crankshaft, camshaft, bearings and flywheel.	Apply
CO3	Illustrate IC engine components, valve mechanisms, and valve timing diagrams through lab experiments.	Apply
CO4	Practice inspection and routine maintenance on engine lubrication and cooling systems and suggest corrective maintenance actions for identified faults	Apply

CO-PO mapping

COURSE ARTICULATION MATRIX											
Course Outcomes	PROGRAM OUTCOMES										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	2	2	-	-	2	-	-
CO2	3	2	2	3	3	2	-	-	2	-	-
CO3	3	3	2	3	-	2	-	-	2	-	2
CO4	3	2	3	3	2	3	2	2	2	-	2
Total	12	8	9	12	7	9	2	2	8	-	4
Correlation Level	3	2	2.25	3	2.33	2.25	2	2	2	-	2

Legends: 1 - Low; 2 - Medium; 3 - High; No Correlation - "-"

Teaching and Assessment Scheme

Teaching Scheme/Week				Self-learning (SS)/Week	Total Hours/Semester	Credits C	Examination Scheme						
							Theory			Practical			Total
L	T	P	S				CIE	ESE	Total	CIE	ESE	Total	
0	0	3	0	1.5	4.5	1.5				60	40	100	100

L: Lecture (One unit is of one-hour duration with one credit), T: Tutorial (One unit is of one-hour duration with one credit), P: Practical (One unit is of one-hour duration with 0.5 credit), S: Project (One unit is of one-hour duration with 0.5 credit) SS: Self-Learning, CIE: Continuous Internal Evaluation, ESE: End Semester Examination

Detailed Syllabus

Expt No.	Experiment name	Practical Outcome	Mapped CO	Taxonomy Level	Instructional Hours
Module I					
1	Calculation of engine cubic capacity	Calculate Cubic capacity of engine using geometrical parameters	CO1	Apply	2
2	Comparison of 2 stroke and 4 stroke engines	Prepare comparison chart (2 stroke and 4 stroke petrol engine)	CO1	Apply	2
3	Comparison of 4 stroke petrol and diesel engines	Prepare comparison chart (4 stroke petrol and 4stroke diesel engine)	CO1	Apply	2
4	Inspection of Cylinder Head	Examine cylinder head, remove carbon deposits, and inspect for warpage using a straightedge and feeler gauge.	CO1	Apply	2
5	Inspection of Cylinder Block & Liners	Capture cylinder bore wear (taper and ovality) using a bore gauge and inspect cylinder liner condition.	CO1	Apply	2
6	Piston & Ring Service	Practice removal and inspection of piston rings, measure ring clearances, and reinstall the piston assembly correctly as per standard procedure.	CO1	Apply	2
Module II					
7	Piston Pin Inspection & Fitment	Practice removal of piston pin (gudgeon pin), inspect for wear or discoloration, and check clearance/fitment in the connecting rod small end and piston boss.	CO2	Apply	3
8	Crankshaft & Bearing Inspection	Examine crankshaft main and crankpin journals for wear using a micrometer and inspect main bearings for scoring.	CO2	Apply	3
9	Measurement of crankshaft Runout	Examine crankshaft bending or run-out and determine whether it is within permissible limits.	CO2	Apply	3
10	Flywheel Inspection	Examine the flywheel for ring gear teeth damage, face run-out, and pilot bearing condition	CO2	Apply	3
Module III					
11	Identification of valve train and valve operating mechanisms	Demonstrate valve train components and adjust tappet clearance	CO3	Apply	3
12	Study of SOHC, DOHC and VVT Mechanisms	Demonstrate SOHC, DOHC and VVT mechanisms, and explain their working principles and impact on engine performance and valve timing.	CO3	Apply	3
13	Illustration of valve timing diagram of four-stroke engine	Illustrate valve timing diagram	CO3	Apply	3
14	Valve and Valve Seat Inspection	Exercise the dismantling of valves using a valve spring compressor, inspect valve stems/margins for wear, and perform basic valve lapping using grinding paste	CO3	Apply	3
Module IV					
15	Engine oil changing procedure and selection of suitable engine oil	Practice engine oil draining, filter cleaning/replacement and refilling with correct oil grade for 2 wheeler or 4 wheeler	CO4	Apply	3
16	Overhauling of oil pump and assessment of serviceability	Examine oil pump components and decide serviceability or replacement based on condition	CO4	Apply	3

17	Overhauling and Performance Testing of Engine Cooling System with Water Pump, Thermostat and Radiator Flushing.	Practice overhauling of engine cooling system components including water pump, test thermostat operation, perform radiator flushing, and reassemble the system as per standard procedure.	CO4	Apply	3
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Open-ended experiment

Objective:

To encourage creativity, innovation, and application of knowledge by allowing students to design and perform an experiment beyond the prescribed list, using the concepts learned during the course.

Description:

At the end of the laboratory course, each student (or group of students) shall undertake one open-ended experiment. In this activity, students are expected to conceive, design, and implement an experiment of their own choice related to the course outcomes. The aim is to apply theoretical knowledge and laboratory skills to a new or practical problem not explicitly covered in the regular experiments.

Students may choose to:

Modify or extend an existing experiment to explore additional parameters or behaviors.
Integrate multiple concepts from the syllabus into a combined application.
Design a mini-setup or prototype to demonstrate a principle or solve a simple engineering problem.
Perform a comparative study or performance analysis of a circuit/system/component.

Student Activities for Self-Learning

Week	Self-Learning description	Hours
Module I		
1	Study construction, materials and functions of cylinder block, crankcase and oil pan.	2
2	Study combustion chamber types, cylinder head construction and manifold design (intake & exhaust).	2
3	Prepare labelled sketches and summary table of all components using cut-section references.	1.5
Module II		
5	Prepare notes on crankshaft journals, bearing types and clearance measurement methods.	1.5
6	Draw layout of piston-connecting rod assembly with fitment types.	1.5
7	Study flywheel types and applications (solid, rim, dual mass).	1
8	Study torque specifications and tightening sequence procedures.	1.5
Module III		
9	Draw and explain valve train components with tappet clearance adjustment.	1.5
10	Prepare comparison chart of SOHC and DOHC engines.	1.5
11	Study working principle of VVT and its advantages.	1
12	Draw theoretical and actual valve timing diagram of four-stroke engine.	1.5
Module IV		
13	Study classification and grades of engine oils (SAE ratings).	2
14	Prepare layout diagram of lubrication system (wet sump & dry sump).	2
15	Study cooling system components and thermostat operation.	2
Total Self-Learning hours		22.5

Learning Resources

TEXT BOOK			
Sl. No.	Title	Author	Publication
1	Vehicle maintenance and garage practice	Doshi, Jigar A Panchal, Dhruv U. Maniar, Jayesh P	Dhanpat Rai Publications
2	Automobile Engineering Practical	N. Malhotra	Computech Publications Limited (Asian Publishers)

REFERENCE			
Sl. No.	Title	Author	Publication
1	Automotive Mechanics	William H. Crouse & Donald L. Anglin	McGraw Hill India

2	Automotive Technology	Jack Erjavec	Delmar Cengage Learning
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WEB RESOURCES		
Sl. No.	URL	Modules Covered
1	https://www.youtube.com/watch?v=9KKfiYch1FE	I & II
2	https://nptel.ac.in/courses/112/104/112104033	III
3	https://www.sae.org	IV

Major Equipment/Instruments/Components required for a batch of 30 students

Sl. No.	Particulars	Specifications	Quantity
1	Multi-Cylinder Engine	4-Stroke petrol/diesel	1
2	Cut-Section Engine Model	4-Stroke (Petrol/Diesel)	1
3	single cylinder 4 stroke petrol engine	Single cylinder 4 stroke petrol engine	1
4	Cylinder Bore Gauge	Dial type with standard anvils (for taper/ovality)	4
5	Outside Micrometer Set	Range: 0-25mm, 25-50mm, 50-75mm, 75-100mm	6 sets
6	Vernier Caliper	Analog/Digital, 0-150 mm	10
7	Dial Indicator with Stand	Magnetic base type	4
8	Feeler Gauge Set	Standard metric blades (0.05 - 1.00 mm)	10
9	Straight Edge	Precision Steel / Cast Iron	4
10	V-Blocks	Matched pairs for supporting shafts	2 Pairs
11	Degree Wheel & Pointer (for valve timing diagram)	360-degree graduated disc	1
12	Torque Wrench	Range 10-150 Nm	4
13	Piston Ring Compressor	Adjustable band type	2
14	Piston Ring Expander	Plier type	2
15	Valve Spring Compressor	C-Clamp or Lever type	4
16	Oil Filter Wrench	Chain, Strap, or Claw type	4
17	Oil Drain Pan	Capacity ~8 Liters	4
18	Thermostat Testing Setup	Heating vessel, Thermometer (>100°C), Heater	1
19	Surface Plate	Cast iron or Granite	1
20	Oil Pump Assembly	Gear or Rotor type	4
21	Water Pump Assembly	Centrifugal type	4
22	Radiator Unit	honeycomb type	2
23	Spare Piston & Connecting Rod	For practicing ring removal and pin fitment	6
24	Standard Tool Kit	Spanners (6-32mm), Sockets, Pliers, Screwdrivers, Hammers	5 sets
25	Workbench with Vice	Heavy-duty	6
26	Cleaning Trays	Metal trays for parts washing	10
27	VVT, DOHC, SOHC working models		1 each
28	Valve lapping Tool	Hand operated suction cup type	5
29	Single cylinder 2 stroke petrol engine	Single cylinder 2 stroke petrol engine	1
30	Coolant Hydrometer	Antifreeze density testing type	2

Major Software required for a batch of 30 students

Sl. No.	Particulars	Specifications	Quantity
	NA		

Assessment Methodology - Lab

Mode	Attendance	CE	CA1	CA2	OEE	ESE
		Continuous evaluation	Practical test (first half of experiments)	Practical test (second half of experiments)	Open-ended experiment	Practical
Duration			3 hours	3 hours		3 hours
Exam mark		50	40	40	50	40
Converted to		30	15	15	10	
Marks	5	30	15		10	40
Total marks	60					40
Total marks	60					40
Tentative schedule	End of semester	Every lab slot	7th week	14th week	15th week	

Scheme of Evaluation - Practical (Continuous Internal Evaluation)

Sl. No.	Criteria	Description	Marks
1	Preparation & Punctuality	Attendance, timely submission of record, pre-lab preparation, understanding of experiment objectives and theory.	10
2	Experimental Setup & Procedure	Ability to identify components/equipment, correct circuit connections/setup, systematic and safe execution of the procedure.	10
3	Observation & Data Recording	Accuracy and neatness of readings, correct use of units, tabulation, and systematic recording of results.	5
4	Analysis & Result Interpretation	Proper calculations, graphical representation, result verification, discussion, and logical conclusion.	10
5	Viva Voce / Concept Understanding	Clarity of theoretical concepts, explanation of procedure, ability to answer questions related to the experiment.	10
6	Workmanship, Discipline & Teamwork	Laboratory discipline, care of instruments, teamwork, attitude, and safety practices.	5
Total			50

Scheme of Evaluation - Practical Test & End Semester Evaluation

Category	Things to evaluate	Marks
Write-up / Procedure (before experiment)	Aim, circuit diagram/flowchart, stepwise procedure.	10
Experiment Setup & Execution	Correct circuit connections / coding / setup. Handling of instruments/software. Accuracy of execution.	10
Observation & Result / Output	Proper tabulation of readings. Calculations/graphs/program output. Correctness of result / expected outcome.	8
Viva Voce	Conceptual understanding of experiment. Related theoretical knowledge.	8
Record	Completion & neatness of practical record. Proper certification by faculty.	4
Total		40

Scheme of Evaluation - Open-ended experiment

Category	Things to evaluate	Marks
Originality and Relevance of the Idea	Assesses how creative, innovative, and relevant the chosen experiment is to the course objectives.	10
Clarity of Objectives and Experimental Plan	Evaluates how clearly the student defines the aim, scope, and systematic plan of the experiment.	10
Correctness of Execution and Data Recording	Checks the accuracy, safety, and neatness in performing the experiment and recording observations.	10
Analysis, Interpretation, and Presentation of Results	Measures the student's ability to analyze data, interpret outcomes, and present results logically.	10
Teamwork and Innovation Demonstrated	Judges the level of collaboration, initiative, and creativity shown during the experiment.	10
Total		50