



**Government of Karnataka
Department of Technical Education**

Diploma in Automobile Engineering.

C-25 Scheme of Studies

(Effect from the AY 2025-26)



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Curriculum Structure

III Semester Scheme of Studies- Automobile Engineering

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours/week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	AT	25AT31I	Automobile electrical system	4	0	4	8	6	50	20	50	20	-	-	100
2	AT	25AT32I	IC Engine and Engine Maintenance.	4	0	4	8	6	50	20	50	20	-	-	100
3	AT	25AT33I	Thermodynamics, combustion and engine testing.	3	0	4	7	5	50	20	-	-	50	20	100
4	AT	25AT34I	Automobile Fuels and pollution control.	3	0	4	7	5	50	20	-	-	50	20	100
Audit Course															
5	KAN	25KA31T	Kannada -I Sahithya Sinchana-I/Balake Kannada-I	2	0	0	2	2	50	20	-	-	-	-	50
Total				16	0	16	32	24	250	-	100	-	100	-	450



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Curriculum Structure

IV Semester Scheme of Studies- Automobile Engineering

Sl. No.	Teaching Department	Course Code	Course Name	Hours per week			Total Contact Hours/week	Credits	CIE Marks		Theory SEE Marks		Practice SEE Marks		Total Marks
				L	T	P			Max	Min	Max	Min	Max	Min	
Integrated Courses															
1	AT	25AT41I	Hydraulics and Pneumatics	4	0	4	8	6	50	20	50	20	-	-	100
2	AT	25AT42I	Advanced Automotive Systems	4	0	4	8	6	50	20	50	20	-	-	100
3	AT	25AT43I	Vehicle body engineering and dynamics.	3	0	4	7	5	50	20	-	-	50	20	100
4	AT	25AT44I	Machine design and drafting	3	0	4	7	5	50	20	-	-	50	20	100
Audit Course															
5	KA	25KA41T	Kannada -II Sahithya Sinchana-II/Balake Kannada-II	2	0	0	2	2	50	20	-	-	-	-	50
Total				16	0	16	32	24	250	-	100	-	100	-	450



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Automobile Engineering	Semester	III
Course Name	Automobile electrical system	Type of Course	Integrated
Course Code	25AT31I	Contact Hours/Week	08
Teaching Scheme	L: T: P. 4:0:4	Credits	06
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale: The automobile has various electrical systems for its efficient working. The student must justify the use of various electrical systems in automobiles. The student should also be able to perform trouble shooting and service activities of electrical components and systems.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Perform the Service and troubleshooting activities of different Batteries of automobile.
CO-02	Perform the Service and troubleshooting activities of charging and Starting systems.
CO-03	Perform the Service and troubleshooting activities of ignition systems and their components.
CO-04	Perform the Service and troubleshooting activities of Lighting and accessories.

3. Course Content:

WEEK	CO	PO	Theory	Practice
1	1	1,2,4	Battery -Purpose, types, construction and working of Lead acid battery. Battery capacity, Battery efficiency, battery Rating-Cold rating, twenty-hour rating. Battery charging-constant voltage and constant current methods of charging.	Conduct an experiment to check the battery charge condition using hydrometer, Voltmeter. Test the battery condition using a battery tester. Practice Preparation of electrolyte and charging of battery. Practice on finding the defects and troubleshooting of batteries.
2	1	1,4,5	Lithium-ion battery – list types, Construction and working of Lithium-ion battery. Comparison of	Demonstrate the Circuit diagram for Earth return system (Positive and negative) and insulated wire return

			Lead acid and lithium-ion batteries. Types of circuits- Different electrical symbols. circuit diagrams of Earth return system, insulated wire return system-merits and demerits.	system. Practice safe disposal of batteries.
3	2	1,2,4	Charging system Purpose- DC generator-principle-charging circuit, Alternator -working principle, construction and working- charging circuit, Comparison between generator and alternator. Electronic voltage regulators- construction and working.	Practice on servicing of DC generator and testing. Practice on servicing of alternator and testing. Troubleshooting of charging system.
4	2	1,2,4	Starting system Requirements- circuit diagram, starting motor – working principle-list types. Series-shunt wound motor- construction and working, Drive mechanism-need-list types, construction and working of Standard Bendix drive, Positive engaging drive with shift lever and Over running clutch drive.	Practice on Servicing of starter motor. Practice on Servicing of starter motor drives. Trouble shooting of starting system.
5	3	1,2,4	Ignition system Requirement-list types. Battery coil ignition system-circuit diagram-function of each component. Ignition coil-function-construction and working.	Practice to build ignition circuit Practice on setting of ignition timing Trouble shooting of ignition system
6	3	1,2,4	Magneto ignition system-list types, working of High-tension rotating magnet type ignition system. Electronic Ignition system – circuit diagram-working, Distributor less ignition system-circuit diagram-working.	Practice on Servicing of magneto ignition system. Trouble shooting of magneto ignition system.

7	3	1,4	<p>Spark plug-construction-specification, spark plug gap, heat range and reach, Hot and cold plugs,</p> <p>Firing order-need-firing orders of 3, 4 & 6 cylinder inline engines.</p>	<p>Practice on servicing of spark plug and setting of gaps.</p> <p>Practice on testing spark plugs using spark plug testing machine.</p> <p>Practice on identification of engine condition by observing the condition of spark plug terminals.</p>
8	4	1,4	<p>Lighting system</p> <p>Circuit diagrams of head light, parking light, side indicator, brake light, reverse gear light, Head light-construction, Fuses-need-types.</p>	<p>Practice on aiming of head lights.</p> <p>Practice on replacing bulbs and fuses with safe disposal</p>
9	4	1,2,4	<p>Bulbs</p> <p>Types of bulbs with applications. Construction and Working of Halogen head light bulb, HID bulb, LED bulb merits, and demerits of LED bulb.</p>	<p>Practice on finding open and short circuits of lighting system.</p> <p>Practice on replacement of bulb assemblies and relays.</p>
10	4	1,4	<p>Accessories</p> <p>Construction and working of-windscreen wipers, horn, electrically adjustable outside rear view mirrors, defroster,</p>	<p>Practice on servicing of wiper motor and linkages.</p> <p>Practice on replacing wiper blades.</p> <p>Practice on servicing and tuning of horn.</p>
11	4	1,2,4	<p>Construction and working of analog type electrical fuel gauge, oil and temperature gauge, Speedometer, odometer.</p>	<p>Service and trouble shoot the circuits of electrical fuel gauge, oil and temperature gauge, Speedometer, and odometer.</p>
12	4	1,4	<p>Switches – Types, construction and working of Pushbutton and Solenoid switch.</p> <p>Construction and working of Dim-Dipper switch.</p>	<p>Practice on replacement of switches</p> <p>Practice on fault finding in the lighting circuit.</p>
13	4	1,3,4	<p>Wiring harness-meaning, need. Different types of cable connectors, wire specifications, color code of wires used in automobile circuits. Complete wiring circuit diagram of two-wheeler and four-wheeler.</p>	<p>Construct and demonstrate the two-wheeler and four-wheeler circuit diagrams.</p>

4. References:

Sl., NO	Title of the book	Author	Publisher
1	Automobile Electrical Equipment	Kohli	Tata McGraw-Hill
2	Automobile Engineering Vol-2	Kirpal Singh	Standard Publications
3	The Automobile Engineering Vol-2	K.M Gupta	Umesh publications
4	Diesel Engineering Electricity & Electronics	Joseph Bell	Cengage
5	Principals of Electrical Engineering & Electronics	V. K Mehta & Rohit Mehta	S Chand & Co
6	A system approach to Automotive Technology	Jack Erjavec	Cengage
7	The Automobile Engineering	Harban Singh Reyath	S Chand & Co
8	The Automobile Engineering	Er S K Gupta	S Chand & Co
9	Automobile Electrical Equipment	W. H. Crouse	Tata McGraw-Hill

5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week (At the End Of)	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					50 Marks

6. SEE - Theory Assessment Methodologies

Sl. No	SEE - Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

Rubrics for Portfolio evaluation
Level of Achievement

Assessment Parameter		Excellent (10)	Very Good (8)	Fair (6)	Poor (4)	Score
AP1	Organization of Report and Timely Submission	Lab report is well organized as directed and submitted on time	Lab report is well organized but not submitted on time	Report contains few errors and not submitted them	Poor organization and late submission	
AP2	Knowledge of Tools and Procedures	Demonstrates deep knowledge of tools and procedures; answer the related questions with explanations and elaboration	Adequate knowledge of most tools and procedures; answer the related questions, but fails to elaborate	Superficial knowledge of tools and procedures; able to answer only some of the related basic questions	Lack of information about most of the tools and procedures; cannot even answer basic related questions	
AP3	Team Working Skills	Positive in interacting with all group members, encourages such interaction in others, and always sensitive to the abilities and feelings of others' contributions; Actively helps to identify group goals and works effectively to meet them in assigned roles	Interacts with all group members spontaneously and contributes in a way that is sensitive to the abilities and feelings of others; Demonstrates commitment to group goals and carries out assigned roles effectively	Interacts with other group members if prompted, but sometimes expresses opinions which are insensitive to the abilities and feelings of others; Demonstrates commitment to group goals, but has difficulty performing assigned roles	Rarely interacts within a group, even with prompting, and shows frequent lack of sensitivity to others' feelings and abilities in opinions expressed; Shows little commitment to group goals and fails to perform assigned roles	
AP4	Result Analysis and Data Interpretation	Excellent insight and well-focused results and discussion; Data completely and appropriately interpreted and no over interpretation	Adequate insight but missed some important points in results and discussion; Interpreted most data correctly but some conclusions may be suspect or over-interpreted	Little insight and analysed only the most basic points; Interpreted some data correctly but significant errors, omissions still present.	No insight and entirely missed the point of the experiment; Little or no attempt to interpret data or over interpreted data.	
AP5	Task Management	Very Effective in managing the assigned task and allow experimenter(s) to achieve all goals	Somewhat effective in managing the assigned tasks and allow experimenter(s) to achieve most goals.	Somewhat ineffective in managing the assigned task and allow experimenter(s) to achieve only few goals.	Very ineffective and would not allow experimenters to achieve any goals	

7. CIE -1 Theory Test model question paper

Program	Automobile Engineering			Semester - III	
Course Name	Automobile electrical system			Test	I/III
Course Code	25AT31I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer one full question from each section. Each full question carries equal marks.					
Q.No	Questions	Cognitive Level	Course Outcome	Marks	
Section - 1					
1	a) List the different types of batteries. 5m b) Explain the Construction and working of lithium-ion battery with a neat sketch. 10m c) Compare lead acid batteries with lithium-ion batteries. 10m	L1 L2 L3	1	25	
2	a) State the advantages and disadvantages of an insulated earth return system. 5m b) Explain the working of lead acid battery with equation.10m c)List the causes and remedies for 1. Loss of electrolyte 2. short circuiting of lead acid battery.10m	L1 L2 L3	1		
Section - 2					
3	a) State the requirements of Starting system 5m b) Explain the Construction of DC generator with a neat sketch 10m c)Explain working of electronic voltage regulator. 10m	L1 L2 L3	2	25	
4	a) State the purpose of charging system. 5m b) Explain with sketch construction and working of Standard Bendix drive 10m c)Explain the construction and working of overrunning clutch 10m	L1 L2 L3	2		

7. CIE Practice Test model question paper:

Program	Automobile Engineering			Semester	III
Course Name	Automobile electrical system			Test	II/IV
Course Code	25AT31I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions				CO	Marks
1. Conduct an experiment to check the battery charge condition using hydrometer.				1	50
OR				3	
2. Test the battery condition using battery tester and identify the troubles and suggest suitable remedies.				1	
1. Conduct the experiment to trouble shoot and service magneto ignition system.				3	
OR					
2. Conduct the experiment to trouble shoot and service the battery ignition system.					
Scheme of assessment:					
a) Procedure writing - 3+3= 6 Marks					
b) Conduction/ Trouble shoot/ Calculation and result=10+3+2=15 (15 x 2 =30 Marks)					
c) Viva -voce - 10 Marks					
d) Portfolio evaluation of practical record- 4 Marks					
Total Marks					50

Signature of the Course Coordinator

HOD

IQAC

8. Suggestive Activities for Tutorials:

The List is an Example and not inclusive of all possible activities of the course. Students and Faculty are encouraged to choose activities that are relevant to the topic

Sl.No.	Suggestive Activities for Tutorials
01	Construct a circuit of chargers and prepare detailed report
02	Construct a earth return circuit and prepare a detailed report.
03	Prepare a trouble shooting chart for charging system
04	Prepare a trouble shooting chart for starting system
05	Construct a battery coil ignition circuit to prepare detailed report
06	Build completes a car wiring circuit and prepare detailed report

Note: two activities, each activity for 50 marks with proper rubrics.

9 Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1	Collection of data/ Material	Limited information	Collect basic information	Collect more information	Collects developed information	Collects a great deal of information	
2	Quality of data	Irrelevant	Less relevant	Needs improvement	Satisfactory	Very relevant	
3	Quality of report	Not planned	Less organized	Moderately organized	Organized	As per the standards	
4	Timely submission	Late submission	Submits after due date	Submits after reminders	Submit after a reminder	On time submission	
5	Data references	No references.	Irrelevant references.	References not from authentic source.	Given references are from authenticated sources.	Enough authenticated references are given.	
Example: Average Marks= (8+6+4+2+6=26)							

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

10. Equipment/software list with Specification for a batch of 30 students.

Sl.No.	Particulars	Quantity
1.	Electrician tool kit	2
2.	Arbor press	1
3.	Voltmeter, Ammeter, Multi meter, Tong tester, feeler gauges,	2 each
4.	Air compressor	1
6.	Three jaw bearing pullers	2
7.	Growler	2
8.	Multifunction tester	2
9.	Battery Charger	1
10.	Spark plug cleaning & testing machine	1
11.	Neon timing light	2
12.	Tacho-dwell tester	1
13.	Hydrometer	4
14.	Cell tester and Battery Tester.	4
15.	Test lamps	2
16.	Auto electrical test bench	1
17.	Automotive electrical system trainer kit.	02



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Automobile Engineering	Semester	III
Course Name	IC Engine and Engine Maintenance	Type of Course	Integrated
Course Code	25AT32I	Contact Hours	8 Hrs./week
Teaching Scheme	L: T:P, 4:0:4	Credits	06
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale:

I.C. engines are still the primary power source of automobiles. The student needs to justify different constructional features of components of IC engines. The students also need to develop skills to maintain and service the IC engines to keep them working efficiently.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Perform different servicing activities of IC engine components using proper tools with standard procedure.
CO-02	Perform different servicing and maintenance activities of engine fuel feed system and manifolds.
CO-03	Perform different servicing and maintenance activities of engine cooling system.
CO-04	Perform different servicing and maintenance activities of engine lubrication system

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,2,4,5	Engine components- Cylinder head- function, construction, materials. Cylinder head gasket- function, list types, materials. Crankcase- function, construction, materials.	Disassemble, clean, and inspect cylinder heads. Practice on decarbonising of cylinder head. Check the cylinder head twist and wrap. Practice on surface grinding of cylinder head.
2	1	1,4,5	Cylinder block - function, types, construction, materials. Cylinder liner- function, wet & dry liner- construction- comparison.	Check the taperness and ovality of cylinder bore using dial bore gauge. Practice on performing reboring using proper tools and process.

3	1	1,4	<p>Valves - Function, list types, Poppet valve – construction - materials.</p> <p>Sodium cooled valves – need - construction.</p> <p>Valve operating mechanism- list types, construction and working of overhead valve and overhead cam Mechanism.</p> <p>Valve clearance- importance.</p> <p>Tappets- function, list types.</p>	<p>Disassemble, clean, and inspect Valves and Springs.</p> <p>Practice on Reconditioning of Valve and Valve lapping.</p> <p>Practice on checking and adjusting the tappet clearance.</p> <p>Reassemble the valve into the head.</p>
4	1	1,2,4	<p>Piston- requirements –function- construction - materials.</p> <p>Types of piston head, piston expansion control methods, Construction -T slot type. Bi-metal piston.</p>	<p>Perform the ridge reaming process.</p> <p>Disassemble, clean, and inspect piston.</p> <p>Practice on checking & cleaning the ring groove.</p>
5	1	1,2,4	<p>Piston Ring – Function, Piston Ring Terminology.</p> <p>Compression & Oil control ring – construction- material.</p> <p>Piston Pin - Function, Construction, Material.</p> <p>List piston pin retaining methods, Construction of Fully floating method.</p>	<p>Disassemble, clean, and inspect Piston Rings and check the End gap.</p> <p>Disassemble, clean, and inspect Piston pin.</p> <p>Reassemble the piston ring and pin.</p>
6	1	1,2,4	<p>Connecting Rod- Function, Construction, Material.</p> <p>Crankshaft - Function, type, Construction, Material.</p> <p>Camshaft - Function, Construction, material.</p>	<p>Check and adjust the Alignment of Connecting rod.</p> <p>Disassemble, clean, and inspect Crankshaft, inspect for crack detection using magnetic crack detector.</p>
7	1	1,4	<p>Flywheel - Function, Construction, Material.</p> <p>Valve drive trains – timing belt, gear, and chain</p> <p>Vibration damper- Need, list types, Construction of rubber crankshaft damper.</p>	<p>Disassemble, clean, and inspect Flywheel.</p> <p>Practice on flywheel facing.</p> <p>Practice to remove the timing belt and adjust the tension.</p> <p>Assemble the engine and set the ignition/injection and valve timing.</p>

8	2	1,4	<p>Fuel supply system in SI engine – list types, Gravity feed system and Pump Feed system -layout -Working</p> <p>Carburetor- Function, list types, Construction and working of simple carburetor.</p> <p>Fuel Pump- Function, Types, Construction and working of Mechanical pump & Electrical fuel pump.</p>	<p>Servicing of two wheeler carburettor.</p> <p>Disassemble, clean, and inspect the Mechanical & Electrical fuel pump.</p>
9	2	1,4	<p>Fuel supply system in CI engine –list types, layout of In-line injection pump fuel feed system.</p> <p>Fuel injection Pump- Function- Construction and working of Inline FIP.</p>	<p>Practice on FIP servicing.</p> <p>Conduct the FIP Calibration.</p> <p>Practice on Replacement of fuel filter.</p>
10	2	1,4	<p>Governor - Function, list types, Construction and working of centrifugal governor.</p> <p>Fuel Injectors - Function, list types, Construction and working of multi hole type Fuel injector.</p> <p>Fuel filter - Function, list types, Construction and working of diesel fuel filter and Water separator.</p>	<p>Conduct the Fuel injector servicing and testing.</p> <p>Practice on replacing the Fuel filter.</p>
11	2	1,4	<p>Air filter - Function, list types, Construction of dry & oil bath air filter.</p> <p>Intake Manifolds - Function, Construction, Material.</p> <p>Exhaust manifold - Function, Construction, Material.</p> <p>Mufflers - Function, list types, Construction of Baffle type muffler.</p>	<p>Practice of Cleaning air filter.</p> <p>Practice of Cleaning the exhaust manifold and intake manifold.</p>
12	3	1,2,4	<p>Cooling system –Function, Requirements, types.</p> <p>Water-cooling & Air-cooling system – Construction-working – Comparison.</p>	<p>Perform the Servicing of the Radiator.</p> <p>Perform the Servicing of water pump.</p> <p>Practice on reverse flush of</p>

			Construction and working of Radiator, water pump. Thermostat valve - need- list types- Construction and working of Wax type. Coolant - list types, requirements.	cooling system. Inspect and check for proper working of thermostat valve.
13	4	1,2,4,5	Lubrication system – list types, Function, requirements. Construction and Working of Pump lubrication and Splash Lubrication systems. Lubricants - Types, SAE ratings of lubricants. Oil filter - Function, Types-construction and working.	Practice on Checking and refilling of the engine oil. Practice on Replace the Oil filter. Perform the servicing of the Oil Pump. Practice on safe disposal of used oil and filters.

4. References:

SN	Title of the book	Authors Name	Publishers name
1	Automobile Engineering Vol-2	Kripal Singh	Standard Publications
2	Automobile Engineering	R B Gupta	Satya Prakashan
3	Automotive Engines	S Srinivasan	Tata McGraw-Hill
4	Automotive Technology	H M Sethi	Tata McGraw-Hill
5	IC engines	M L Mathur, R P Sharma	Dhanpath Rai Publications
6	Automotive Engineering Vol-2	Anil Chikara	Satya Prakashan
7	Basic Automobile Engineering	C P Nakra	Dhanpath Rai Publications
8	Automobile Technology	N K Giri	Khanna Publications
9	Automotive Mechanics	Crouse and Anglin	Tata McGraw-Hill
10	Automotive Engines (Diagnosis, Repair and rebuild)	Tim Gilles	Cengage Publications

Websites:

1. <https://www.youtube.com/watch?v=9BYm0HnLGRU>
2. <https://www.youtube.com/watch?v=5W1ucQsksSA>
3. <https://www.youtube.com/watch?v=wyspAHRMbb8>
4. <https://www.youtube.com/watch?v=zUuVQfvWSnI>
5. <https://www.youtube.com/watch?v=V7inC4lOpGs>
6. <https://www.youtube.com/watch?v=f45kAmjAOYA>
7. <https://www.youtube.com/watch?v=HclvBmwWgQ>
8. <https://www.youtube.com/watch?v=DG-STqFiCg0>
9. <https://www.youtube.com/watch?v=mmmcyj53TNic>
10. <https://www.youtube.com/watch?v=eFe43SnBIMI>
11. <https://www.youtube.com/watch?v=qUzvNA2b4ms>
12. <https://www.youtube.com/watch?v=MOoQMT9EfnQ>

13. https://www.youtube.com/watch?v=EbjDH7fr_I8
14. <https://www.youtube.com/watch?v=9-GSNR7W73M>
15. <https://www.youtube.com/watch?v=F6wmSCgVWOM>
16. www.youtube.com/watch?v=jHZ4giLdbtc
17. http://lh5.ggpht.com/dSeRrhZ5pEA/TdrCh5n7X2I/AAAAAAAAAOM/cNk-nB96CVU/Howmechanicalpumpworks_thumb4.jpg?imgmax=800
18. <https://www.youtube.com/watch?v=0ycvbFxB87s>
19. <https://www.youtube.com/watch?v=BaEHVpKc-1Q>

Rubrics for Portfolio evaluation						
Level of Achievement						
Assessment Parameter		Excellent (10)	Very Good (8)	Fair (6)	Poor (4)	Score
AP1	Organization of Report and Timely Submission	Lab report is well organized as directed and submitted on time	Lab report is well organized but not submitted on time	Report contains few errors and not submitted on time	Poor organization and late submission	
AP2	Knowledge of Tools and Procedures	Demonstrates deep knowledge of tools and procedures; answer the related questions with explanations and elaboration	Adequate knowledge of most tools and procedures; answer the related questions, but fails to elaborate	Superficial knowledge of tools and procedures; able to answer only some of the related basic questions	Lack of information about most of the tools and procedures; cannot even answer basic related questions	
AP3	Team Working Skills	Positive in interacting with all group members, encourages such interaction in others, and always sensitive to the abilities and feelings of others' contributions; Actively helps to identify group goals and works effectively to meet them in assigned roles	Interacts with all group members spontaneously and contributes in a way that is sensitive to the abilities and feelings of others; Demonstrates commitment to group goals and carries out assigned roles effectively	Interacts with other group members if prompted, but sometimes expresses opinions which are insensitive to the abilities and feelings of others; Demonstrates commitment to group goals, but has difficulty performing assigned roles	Rarely interacts within a group, even with prompting, and shows frequent lack of sensitivity to others' feelings and abilities in opinions expressed; Shows little commitment to group goals and fails to perform assigned roles	
AP4	Result Analysis and Data Interpretation	Excellent insight and well-focused results and discussion; Data completely and appropriately interpreted and no over interpretation	Adequate insight but missed some important points in results and discussion; Interpreted most data correctly but some conclusions may be suspect or over-interpreted	Little insight and analysed only the most basic points; Interpreted some data correctly but significant errors, omissions still present.	No insight and entirely missed the point of the experiment; Little or no attempt to interpret data or over interpreted data.	
AP5	Task Management	Very Effective in managing the assigned task and allow experimenter(s) to achieve all goals	Somewhat effective in managing the assigned tasks and allow experimenter(s) to achieve most goals.	Somewhat ineffective in managing the assigned task and allow experimenter(s) to achieve only few goals.	Very ineffective and would not allow experimenters to achieve any goals	

5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	Average of all CIE=50 Marks
1.	CIE-1TheoryTest	4	90	50	
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					50 arks

6. SEE - Theory Assessment Methodologies

Sl. No	SEE - Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE -1 Theory Test model question paper

Program	Automobile Engineering			Semester -	
Course Name	IC Engine and Engine Maintenance			Test	I/III
Course Code	25AT32I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					
Q.No	Questions		Cognitive Level	Course Outcome	Marks
Section - 1					
1	a) State the functions of gaskets 5m b) Sketch and explain construction of crankcase 10m c) explain different types of Liners 10m		L1 L3 L3	1	25
2	a) State different types of valves 4m b) Explain the construction of poppet valve with a neat sketch 10m c) Explain overhead cam valve operating mechanism 10m		L1 L3 L3	1	
Section - 2					
3	a) List the functions of cylinder block 4m b) List the causes for uneven wear of cylinder block 10m c) Sketch and explain the piston 10m		L2 L2 L3	1	25
4	a) List the requirements of piston b) Sketch and explain T slot type piston expansion control method 10m c) Explain construction of sodium cooled valve		L2 L2 L3	1	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.					

Signature of the Course Coordinator

Signature of the HOD

Signature of the IQAC Chairman

8. CIE-1 Practice Test model question paper

Program	Automobile Engineering			Semester	
Course Name	IC Engine and Engine Maintenance			Test	II/IV
Course Code	25AT32I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions				CO	Marks
1) Decarbonise the Cylinder Head and check the cylinder head for any damages. 2) Remove the ridge by using ridge reamer and check the cylinder for any possible damage. <p style="text-align: center;">OR</p> 3) Dismantle the valve mechanism and check the valves and components for damages. 4) Decarbonise the piston and check the piston ring grooves and other damages				1	50
Scheme of assessment					
a) Procedure writing 3+3=6 b) Conduction / trouble shooting/ results=10+3+2=15x2=30 c) viva-voce =10 d) Portfolio valuation/record=4					
Total Marks					50

Signature of the Course Coordinator

Signature of the HOD

9. Suggestive Activities for Tutorials:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic

Sl.No.	Suggestive Activities for Tutorials
01	Visit nearby service stations/garages and make report of Engine components, materials and gaskets used along with photographs.
02	Visit nearby garage/service station and collect information on different types of valve mechanism and materials.
03	Collect different types of piston head, piston ring types and materials.
04	Visit nearby garage/service station and collect information on specification of components of different automobile fuel feed systems.
05	Visit nearby garage/service station and collect information on specification of components of different automobile cooling system systems
06	Visit nearby garage/service station and collect information on specification of components of different automobile lubrication systems

10. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1	Collection of data/ Material	Limited information	Collects basic information	Collects more information	Collects developed information	Collects a great deal of information	8
2	Quality of data	Irrelevant	Less relevant	Needs improvement	Satisfactory	Very relevant	6
3	Quality of report	Not planned	Less organized	Moderately organized	Organized	As per the standards	4
4	Timely submission	Late submission	Submits after due date	Submits after reminders	Submit after a reminder	On time submission	2
5	Data references	No references.	Irrelevant references.	Given References not from authentic source.	Given references are from authenticated sources.	Enough authenticated references are given.	6
Example: Average Marks=(8+6+4+2+6)=26							26/50

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11. Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Quantity
1	Open end spanner set.	02
2	Ring spanner set.	02
3	Tubular spanner set.	02
4	Socket set.	02
5	Allen key set.	02
6	Pipe wrench.	02
7	Adjustable screw wrench.	02
8	Torque wrench.	02
9	Water pump pliers.	02
10	Vice grip pliers.	02
11	Combination pliers.	02
12	Nose pliers.	02
13	Circlip pliers.(inside, outside, straight bent)	02 each
14	screw driver (star, flat).	02 set
15	Hammers (ball peen, sledge).	02 each
16	Mallets.	02
17	Pneumatic wrench.	02
18	Electrical wrench.	02
19	Spark plug spanner.	02
20	Chisels.	02 each
21	Punches (hallow, solid)	02 each
22	scrapers.	02 each
23	Files.	02 each
24	Speed handle.	02
25	Oil can.	02
26	Feeler gauge.	02
27	Bench vice.	02
28	Leg vice.	01
29	Harbor press.	01
30	Two-wheeler lifting platform.	01
31	Spark plug cleaning and testing machine.	01
32	Valve spring compressors.	02
33	Oil filter wrench.	01
34	Trays. (1X1mt).	08
35	Two stroke single cylinder petrol engine	02
36	Four stroke single cylinder petrol engine	02



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Automobile Engineering	Semester	III
Course Name	Thermodynamics, combustion and engine testing.	Type of Course	Integrated
Course Code	25AT33I	Contact Hours	7 Hrs./week
Teaching Scheme	L: T:P, 3:0:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale: The IC engines are still in active use around the world and many automotive companies are considering active developments of IC Engines. Hence it is important for the student to learn basics of thermodynamics, fuel combustion and engine testing process.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Demonstrate the basic thermodynamic concepts and gas laws using experiments and simulations.
CO-02	Demonstrate the concepts of heat transfer, thermodynamic process and cycles using simple experiments or simulations.
CO-03	Illustrate the complete concepts of normal and abnormal combustion in IC Engines.
CO-04	Perform different performance tests of IC engines as per standard procedure.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,3,4	Fundamentals of thermodynamics Definition- System, boundary and surrounding. Thermodynamic systems – closed, open and isolated systems with examples. Thermodynamic equilibrium. Thermodynamic state, Process, Cycle.	Illustration of system and surrounding using simple experiments/ Virtual simulations. Illustration of Thermodynamic equilibrium using simple experiments/ Virtual simulations.
2	1	1,3,4	Properties of system- Intensive and Extensive properties with examples. Meaning of pressure (p), Volume (v), Temperature (T), Enthalpy (H), Internal energy (U), work with Examples and the units. Specific heat at constant pressure (C _p), specific heat at constant volume (C _v) and their units.	Demonstrate the different properties of gas by simple experiments or virtual simulations.
3	1	1,2,4	Meaning of NTP and STP.	Demonstrate the Laws of

			Laws of thermodynamics: Zeroth law, first law, second law- Clausius statement, Kelvin-Planck statement.	thermodynamics using simple experiments or virtual simulations.
4	1	1,2,4	Meaning of Perfect gas. Boyle's law, Charle's Law, Gay Loussac's law, Avogadro's law and Joule's law with expressions and applications.	Demonstrate the Boyles law using simple experiments and simulation. Demonstrate the Charle's law using experiments and simulation. Demonstrate the Gay-Lussac law using experiments and simulation.
5	2	1,2,4	Explain Characteristic gas equation, universal gas equation, universal gas constant. Relationship between two specific heats, Characteristic gas constant. Heat Transfer - Definition, Modes of heat transfer with examples, Factors affecting heat transfer.	Demonstrate the modes of heat transfer using simple experiment or virtual lab/ Simulation. Demonstrate the factors affecting heat transfer using simple experiments/Simulations.
6	2	1,2,4	Thermodynamic Process PVT relations, work done, heat transfer, change in internal energy, change in enthalpy and entropy for constant volume, Pressure, temperature, and entropy process. Simple problems.	Demonstrate the work done, change in entropy and enthalpy of a process using experiments/Simulations. Conduct the experiment to study the behaviour of different process using experiments/Simulations.
7	2	1,2,4	Air standard Cycles - definitions and types, assumptions made in air standard cycles. Explain P.V, T-S diagrams, and air standard efficiency of Carnot cycle, Otto cycle, diesel cycle. Simple problems	Conduct the experiment to study the behaviour of Carnot Cycle using computer simulations. Conduct the experiment to study the behaviour of Otto Cycle using computer simulations.
8	3	1,2	Combustion in SI engine - Stages of combustion with pressure vs crank angle diagram. Ignition lag -concept, variables affecting ignition lag. Abnormal Combustion -List types. Pre-ignition-concept, effects, controlling methods. Detonation- definition, process, effects, controlling methods.	Identify different design features of SI engine affecting delay period and knocking. Recreate the knocking in SI engine by changing engine parameters.
9	3	1,4	Combustion in CI engine: Stages of combustion with pressure Vs crank angle diagram. Ignition delay -variables affecting delay period. knocking - definition, process, effects,	Practice to draw the Valve timing diagram for 4 stroke engines. Identify different design features of CI engine affecting delay period and knocking.

			controlling methods.	
10	4	1,4	Engine Performance Dynamometer - Function, list Types. Determination of IHP, BHP, FHP, mean effective pressure - IMEP, BMEP, Engine Torque, Mechanical Efficiency, Thermal Efficiency- Brake Thermal Efficiency.	Demonstrate the different types of dynamometers. Conduct the Performance test for 4 stroke Petrol engine
11	4	1,4	Volumetric Efficiency, Air Standard Efficiency. Specific Fuel consumption- Brake specific fuel consumption, Indicated specific fuel consumption. Performance curves.	Conduct the Performance test for 4 stroke Diesel engine.
12	4	1,2,4	Air fuel ratios requirements. Morse Test -need, limitations. Simple problems on Performance of engine and Morse test.	Conduct the Morse test on multi cylinder Petrol engine.
13	4	1,2,4	Heat balance sheet –concept- Need, Simple Problems.	Conduct the experiment to draw Heat balance sheet on engine.

4. References:

SL., NO	Title of the book	Author	Publisher
1	Thermal Engineering	R.S. Khurmi	S Chand & Co
2	Thermal Engineering	R K Hegde and Niranjana. Murthy	Sapna Publications
3	Basic and applied thermodynamics	P.K. Nag	Tata McGraw-Hill
4	I C Engines	Mathur & Sharma	Danapat Rai & sons
5	I C Engines	V. Ganeshan	Tata McGraw-Hill

5. Websites:

<https://www.youtube.com/watch?v=9GMBpZZtjXM>

<https://www.youtube.com/watch?v=gg-dlrbXxzI>

<https://www.youtube.com/watch?v=Xto88gMmDzw>

<https://www.youtube.com/watch?v=00q7bCSDPxE>

<https://www.youtube.com/watch?v=pucd2b7jZJw>

<https://www.youtube.com/watch?v=K8RzTmeVWfM>

<https://www.youtube.com/watch?v=fyadfj7NQqI>

<https://www.youtube.com/watch?v=YNGtJo-VspE>

<https://www.youtube.com/watch?v=NG41IbDtd44>

<https://www.youtube.com/watch?v=HeofLEQ6wuA>

<https://www.youtube.com/watch?v=W94iksaQwUo>

<https://www.youtube.com/watch?v=ZWKRw0HmBLE>

6. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3.	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5.	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					50 Marks

7. SEE – Practice Assessment Methodologies:

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

8. CIE Theory Test model question paper

Program	Automobile Engineering			Semester - III		
Course Name	Thermodynamics, combustion and engine testing.			Test	I	
Course Code	25AT33I	Duration	90 min	Marks	50	
Name of the Course Coordinator:						
Note: Answer any one full question from each section. Each full question carries equal marks.						
Q.No	Questions			Cognitive Level	Course Outcome	Marks
Section - 1						

1	a) Explain system, boundary and surroundings. 5M b) Explain closed, open and isolated systems with examples. 10M c) Explain pressure, volume, temperature, Enthalpy and internal energy with their units. 10M	L2	1	25
2	a) Explain Thermodynamic equilibrium. 5M b) Explain specific heat at constant pressure and constant volume with their units. 10M c) Explain intensive and extensive properties with examples. 05M	L2	1	
Section - 2				
3	a) Explain work, STP and NTP conditions. 05M b) Explain Boyle's law, Charles's law and Avogadro's law with their expressions. 10M c) Explain Zeroth law and First law of thermodynamics. 10M	L3	1	25
4	a) Explain perfect gas with examples. 05M b) Explain Kelvin plank statement and Clausius statement. 10M c) Explain Gay Loussac's law and Joule's law with expressions. 10M	L3	1	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.				

Signature of the Course Coordinator

Signature of the HOD

Signature of the IQAC Chairman

9. CIE Practice Test model question paper

Program	Automobile Engineering		Semester	III
Course Name	Thermodynamics, combustion and engine testing.		Test	II
Course Code	25AT33I	Duration	180 min	Marks
				50
Name of the Course Coordinator:				
Questions			CO	Marks
1. Illustrate system and surrounding with simple experiment/virtual simulation.			1	50
2. Demonstrate the modes of heat transfer using simple experiment/simulation.			2	
OR				
3. Conduct an experiment to study the behavior of isochoric and isobaric process using virtual lab.			2	

4. Demonstrate Boyle's law using simulation.	1	
Scheme of assessment		
a) Procedure writing- 3+3=6M		6
b) Conduction-10M, troubleshoot/calculation-3M and results-2M, ((10+3+2=15), 15 x 2 experiments = 30M)		30
c) Viva voce – 10M		10
d) Portfolio evaluation of practical record – 4M		04
Total Marks		50

Signature of the Course Coordinator

Signature of the HOD

10. Suggestive Activities for Tutorials:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic

Sl. No	Suggestive Activities for Tutorials
01	Create a physical or simulation model to simulate laws of thermodynamics.
02	Create a report on applications of laws of thermodynamics in engineering.
03	Create a physical or simulation model to demonstrate the laws of thermodynamics.
04	Prepare a report on applications of gas laws in engineering
05	Create a simulation model to draw the different cycles.
06	Prepare a report on various properties of different fuels required for good combustion.
07	Prepare a report on different combustion chambers used in SI engines.
08	Prepare a report on different combustion chambers used in CI engines.
09	Prepare reports on different dynamometers.

11. Rubrics sheet for assessing student activities: (Qualitative assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1	Collection of data/ Material	Limited information	Collects basic information	Collects more information	Collects developed information	Collects a great deal of information	8
2	Quality of data	Irrelevant	Less relevant	Needs improvement	Satisfactory	Very relevant	6
3	Quality of report	Not planned	Less organized	Moderately organized	Organized	As per the standards	4
4	Timely submission	Late submission	Submits after due date	Submits after reminders	Submit after a reminder	On time submission	2
5	Data references	No references.	Irrelevant references.	Given References	Given references	Enough authenticate	6

				not from authentic source.	are from authenticated sources.	d references are given.		
	Example: Total=(8+6+4+2+6=26)							26/50

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

8. Rubrics for Portfolio evaluation						
Level of Achievement						
Assessment Parameter		Excellent (10)	Very Good (8)	Fair (6)	Poor (4)	Score
AP1	Organization of Report and Timely Submission	Lab report is well organized as directed and submitted on time	Lab report is well organized but not submitted on time	Report contains few errors and not submitted on time them	Poor organization and late submission	
AP2	Knowledge of Tools and Procedures	Demonstrates deep knowledge of tools and procedures; answer the related questions with explanations and elaboration	Adequate knowledge of most tools and procedures; answer the related questions, but fails to elaborate	Superficial knowledge of tools and procedures; able to answer only some of the related basic questions	Lack of information about most of the tools and procedures; cannot even answer basic related questions	
AP3	Team Working Skills	Positive in interacting with all group members, encourages such interaction in others, and always sensitive to the abilities and feelings of others' contributions; Actively helps to identify group goals and works effectively to meet them in assigned roles	Interacts with all group members spontaneously and contributes in a way that is sensitive to the abilities and feelings of others; Demonstrates commitment to group goals and carries out assigned roles effectively	Interacts with other group members if prompted, but sometimes expresses opinions which are insensitive to the abilities and feelings of others; Demonstrates commitment to group goals, but has difficulty performing assigned roles	Rarely interacts within a group, even with prompting, and shows frequent lack of sensitivity to others' feelings and abilities in opinions expressed; Shows little commitment to group goals and fails to perform assigned roles	
AP4	Result Analysis and Data Interpretation	Excellent insight and well-focused results and discussion; Data completely and appropriately interpreted and no over interpretation	Adequate insight but missed some important points in results and discussion; Interpreted most data correctly but some conclusions may be suspect or over-interpreted	Little insight and analysed only the most basic points; Interpreted some data correctly but significant errors, omissions still present.	No insight and entirely missed the point of the experiment; Little or no attempt to interpret data or over interpreted data.	
AP5	Task Management	Very Effective in managing the assigned task and allow experimenter(s) to achieve all goals	Somewhat effective in managing the assigned tasks and allow experimenter(s) to achieve most goals.	Somewhat ineffective in managing the assigned task and allow experimenter(s) to achieve only few goals.	Very ineffective and would not allow experimenters to achieve any goals	

9. SEE Model Practice Question Paper.

Program	Automobile Engineering		Semester	III
Course Name	Thermodynamics, combustion and engine testing.	Course Code: 25AT33I	Duration	180 min
Questions			CO	Marks
1. Conduct the experiment to study the behaviour of Otto Cycle using computer simulations.			2	50
2. Conduct the Performance test for 4 stroke Diesel engine.			4	
OR				
1. Conduct the experiments to find work done, change in internal energy and entropy change of isochoric process.			2	
2. Conduct the Morse test on multi cylinder Petrol engine.			4	
Scheme of assessment:				
a) Procedure writing- 3+3=6				6
b) Conduction-10M, troubleshoot/calculation-03M and results-02M, 10+3+2=15M, (15 x 2 experiments = 30)				30
c) Viva voce - 10				10
d) Portfolio evaluation of practical record – 4				04
Total Marks				50

1) Signature of the Examiner

2) Signature of the Examiner

10. Equipment/software list with Specification for a batch of 30 students

Sl., No.	Particulars	Specification	Quantity
01	Gas law demonstration setups	A steel container with adjustable length with electric heating, temperature and pressure gauges	01
02	Computers	24-inch color LED monitor, intel i5 or AMD latest gen processor, 8 GB ram, 512 GB Ram with internet connections	20
03	Heat transfer testing setup	Electric heating, variable length, thickness and material setup with multiple stage temperature measurement	01
04	Single cylinder petrol engine performance test rig	100 to 150 cc 4 stroke petrol engine, air cooled, rope or electric dynamometer, fuel and air consumption setups, speed measurement set up, engine temperature and exhaust temperature set ups.	01
05	Multi cylinder petrol engine test rig	3 or 4 cylinder 800 to 1500CC petrol engine, electric or hydraulic dynamometer, fuel, air consumption, speed measurement, inlet water temperature, outlet water temperature setup, inlet air and exhaust gas temperature measurement set ups, morse test setups	01
06	Single cylinder diesel engine test rig	150 to 500 cc 4 stroke Diesel engine, water cooled, rope or electric dynamometer, fuel, air consumption, speed measurement, inlet water temperature, outlet water temperature setup, inlet air and exhaust gas temperature measurement set ups.	01
07	Multi cylinder diesel engine test rig	3 or 4 cylinder 800 to 1500CC diesel engine, electric or hydraulic dynamometer, fuel, air consumption, speed measurement, inlet water temperature, outlet water temperature setup, inlet air and exhaust gas temperature measurement set ups.	01



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Automobile Engineering	Semester	III
Course Name	Automobile Fuels and pollution control.	Type of Course	Practical
Course Code	25AT34I	Contact Hours	7 Hrs./week
Teaching Scheme	L: T:P- 3:0:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale: Automobile emissions are the major contributors to environmental pollution. Hence, the student should interpret the use of different emission-controlling techniques of conventional fuel IC Engines. The students should also assess various alternative fuels and other alternative power sources for automobiles.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Perform the tests to find different properties of conventional and alternate fuels, and appreciate their importance.
CO-02	Perform service activities and troubleshooting of components of advanced fuel feed system
CO-03	Perform service activities and troubleshooting of components of emission control systems
CO-04	Validate the use of alternate power sources and pollution norms.

3. Course Content:

Week	CO	PO	Theory (4 Hours per week)	Practice (4 Hours per week)
1	1	1,4,5	Fuels –list types. Petroleum fuels, Refining process. Properties of liquid and gaseous fuels. Merits and demerits of liquid and gaseous fuels. Octane and Cetane rating of fuels.	Determination of flash point and fire point of different liquid fuels. Determination of viscosity of petrol and Diesel fuel using a viscometer.
2	1	1,4,5,7	Alternative fuels -list types. Methanol – Properties, merits, demerits, storage, emissions. Ethanol – Properties, merits, demerits, storage, emissions. Engine modifications required for ethanol & methanol fuels.	Determination of the Calorific value of methanol and ethanol using the bomb's calorimeter. Conduct the performance test using blends of ethanol and petrol.
3	1	1,4,5	Biodiesel -properties, merits, demerits, storage, emissions. Biodiesel production processes.	Determination of flash point, and fire point of biodiesel. Conducting performance test using

			Engine modifications required for bio-diesel.	blends of biodiesel and diesel.
4	1	1,4,5	Hydrogen - list types of production process, production using electrolysis of water, properties, merits, demerits, storage, emissions. Engine modifications to use hydrogen. Fuel cells -introduction, list types - Construction and working of PEM type fuel cell.	Conduct an experiment to produce hydrogen using the electrolysis process.
5	2	1,4,5	CNG –properties, merits, demerits, storage, emissions. Layout and working of CNG fuel feed system.	Practice the installation of CNG kit to the car, setting. Practice on maintenance CNG kit.
6	2	1,4	Multipoint fuel injection system-layout, working, merits, list types. Gasoline direct injection system-Working, merits & demerits, construction and working of electronic petrol injector.	Identification of different components of multipoint fuel injection and gasoline direct injection system. Practice removing and refitting different components of the fuel injection system. Practice on Petrol injector cleaning and testing.
7	2	1,4	Electronic Common rail diesel injection system- layout, working. Electronic Unit injection system-layout, working. Construction and working of electronic common rail diesel injector and Unit injector.	Identification of different components of electronic common rail diesel injection system and electronic unit injection system. Practice on servicing of CRDI and UI injectors.
8	2	1,2,4,5	Stratified engine -Need, list types. Supercharging- Need, Turbocharging- Need, list types. Construction and working of turbocharger. Boost control-need, types. working of waste gate method and Variable geometry method.	Practice the Servicing of a supercharger. Practice the Servicing of a turbocharger. Practice the Troubleshooting of turbochargers.
9	3	1,4,5	Pollutants from an automobile Sources of pollutants in SI engine & CI engine. Mechanism of formation of nitrogen oxide, particulate matter,	Practice the measurement of HC, CO, CO ₂ , and O ₂ using an exhaust gas analyzer. Practice the measurement of diesel engine emissions using the smoke meter.

			carbon monoxide and unburnt hydrocarbon in SI and CI engine.	
10	3	1,2,4,5	<p>Crankcase ventilation system-need, layout and working. Exhaust gas recirculation- need, layout and working.</p> <p>Catalytic converters -need, types. Construction and working of 3-way catalytic converter and exhaust manifold reactor.</p> <p>SCR and particulate filters of CI engines – Need, construction and working.</p> <p>Combustion chamber modifications SI and CI Engines to control emissions.</p>	<p>Practice on Servicing of PCV and EGR system.</p> <p>Practice removing and refitting the catalytic converter.</p> <p>Practice the troubleshooting of particulate emission control system of diesel engines.</p> <p>Practice the troubleshooting of PCV and EGR systems.</p>
11	4	1,4,5	<p>Emission norms- need, Driving cycles- types.</p> <p>Bharath stage emission standards and norms.</p> <p>European standards - Comparison of Bharath stage with European standards.</p> <p>Present emission standards for different engines in India.</p>	<p>Prepare a report on the case study of implementing present emission norms.</p> <p>Conduct the test for Emission and fuel consumption under different driving cycles.</p>
12	4	1,5	<p>Pollution- Types - air pollution, water pollution, Noise pollution, soil pollution. Effects of pollution on living things and environment.</p> <p>Reasons and effects of Acid rain and global warming.</p>	<p>Prepare a report on Case studies to control pollution, Soil quality, water, and air quality measurement.</p>
13	4	1,4	<p>Hybrid Vehicle-Need, types. Layout & working of Series hybrid and parallel hybrid systems.</p> <p>Comparison of series to parallel hybrid systems.</p> <p>ARAI- Formation, functions.</p>	<p>Identify the different components of a hybrid vehicle.</p> <p>Demonstration of series and parallel hybrid vehicle working using demo models/test rigs.</p> <p>Prepare a report on the case study of ARAI comprehensive certification and homologation services.</p>

4. References:

SN	Description
1	Alternative fuels - Thipse, Jaico publications.
2	Alternative Fuels & the Environment - Frances S. Sterrett, Hardback Publications.
3	Alternative fuels- V. Ganeshan, McGraw-Hill Education (India)Private Limited, New Delhi
4	Internal combustion Engine-M.L. Mathur and R.P. Sharma, Dhanpath Rai Publications.
5	SAE Transactions - "Vehicle Emission", 3 volumes, 1982
6	Automobiles and Pollution SAE Transaction, 1995.
7	Engine Emissions: pollution Formation and advances in control technology by B.P. Pundir.

Rubrics for Portfolio evaluation						
Level of Achievement						
Assessment Parameter		Excellent (10)	Very Good (8)	Fair (6)	Poor (4)	Score
AP1	Organization of Report and Timely Submission	Lab report is well organized as directed and submitted on time.	Lab report is well organized but not submitted on time	Report contains few errors and not submitted on time them	Poor organization and late submission	
AP2	Knowledge of Tools and Procedures	Demonstrates deep knowledge of tools and procedures; answer the related questions with explanations and elaboration	Adequate knowledge of most tools and procedures; answer the related questions, but fails to elaborate	Superficial knowledge of tools and procedures; able to answer only some of the related basic questions	Lack of information about most of the tools and procedures; cannot even answer basic related questions	
AP3	Team Working Skills	Positive in interacting with all group members, encourages such interaction in others, and always sensitive to the abilities and feelings of others' contributions; Actively helps to identify group goals and works effectively to meet them in assigned roles	Interacts with all group members spontaneously and contributes in a way that is sensitive to the abilities and feelings of others; Demonstrates commitment to group goals and carries out assigned roles effectively	Interacts with other group members if prompted, but sometimes expresses opinions which are insensitive to the abilities and feelings of others; Demonstrates commitment to group goals, but has difficulty performing assigned roles	Rarely interacts within a group, even with prompting, and shows frequent lack of sensitivity to others' feelings and abilities in opinions expressed; Shows little commitment to group goals and fails to perform assigned roles	
AP4	Result Analysis and Data Interpretation	Excellent insight and well-focused results and discussion; Data completely and appropriately interpreted and no over interpretation	Adequate insight but missed some important points in results and discussion; Interpreted most data correctly but some conclusions may be suspect or over-interpreted	Little insight and analysed only the most basic points; Interpreted some data correctly but significant errors, omissions still present.	No insight and entirely missed the point of the experiment; Little or no attempt to interpret data or over interpreted data.	
AP5	Task Management	Very Effective in managing the assigned task and allow experimenter(s) to achieve all goals	Somewhat effective in managing the assigned tasks and allow experimenter(s) to achieve most goals.	Somewhat ineffective in managing the assigned task and allow experimenter(s) to achieve only few goals.	Very ineffective and would not allow experimenters to achieve any goals	

5. CIE Assessment Methodologies:

Sl. No	Assessment	Test Week	Duration (minutes)	Max marks	Average of all CIE=50 Marks
1	CIE-1 Theory Test	4	90	50	
2	CIE-2 Practice Test	7	180	50	
3	CIE-3 Theory Test	10	90	50	
4	CIE-4 Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13	-	50	
Total Continuous Internal Evaluation (CIE)					50 Marks

6. SEE - Practice Assessment Methodologies

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practical	180	50	20

7. CIE Theory Test:

Program	Automobile Engineering			Semester IV	
Course Name	Automobile Fuels and pollution control.			Test	I
Course Code	25AT34I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries 25 marks.					
Q. No	Questions	Cognitive Level	Course Outcome	Marks	
Section - 1					
1	a) List the properties of Liquid and gaseous fuels. -5M b) Explain the engine modifications required for alternative fuel. -10M c) List the properties of Methanol -5M d) Explain the Octane and Cetane rating of fuels. -5M	L2	C1	25	
2	a) List the merits and demerits of Liquid and gaseous fuels. -10M b) Explain the refining process of petroleum products -10M c) List properties of Hydrogen -5M	L2	C1		
Section - 2					
3	a) Explain the method of production of Hydrogen using electrolysis of water. -10M b) List the merits and demerits of Methanol -5M c) Explain the Biodiesel production processes. -10M	L3	C1	25	
4	a) Explain the Construction and working of PEM type fuel cell-10M b) List the merits and demerits of Biodiesel-10M c) List the different types of fuel cells – 5M	L3	C1		
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.					

Course Coordinator

HOD

IQAC Chairman

8. CIE Practice Test

Program	Automobile Engineering		Semester	IV	
CourseName	Automobile Fuels and pollution control.		Test	II	
Course Code	25AT34I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions			CO	Marks	
1. Experiment to calculate the Calorific value of methanol using the bomb's calorimeter.			1,2	50	
2. With the standard procedure Practice the servicing of CRDI and UI injectors.					
OR					
3. Experiment to calculate the flash point, and fire point of biodiesel.			1,2		
4. With the standard procedure Practice the Petrol injector cleaning and testing.					
Scheme of assessment:					
a) Procedure writing. 3+3=6					
b) Conduction – 10M, Troubleshoot/ Calculation – 3M and result -2M =10+3+2=15(15x2=30M)					
c) Viva -voce- 10M					
d) Portfolio evaluation of practical record- 4M					
Total Marks				50	

Course Coordinator

HOD

9. Suggestive Activities:

The List is an Example and not inclusive of all possible activities of the course. Students and Faculty are encouraged to choose activities that are relevant to the topic. Two activities, each for 50 marks should be evaluated with proper rubrics.

SN	Suggested Activity
1	Study the benefits of different alternative fuels and submit the report on the best alternative fuel for transit buses with proper justification.
2	List the properties of hydrogen and prepare a presentation on hydrogen fuel cell vehicles.
3	Take a survey on the effects of vehicular pollution on human health and present the effects of pollution on human health.
4	Refer to any one journal paper and present the mechanism of pollutant formation in an IC engine.
5	Prepare a report on hydrogen internal combustion engines.
6	Study and document the effect of the Diesel particulate trap on the efficiency of the engine and submit it as an assignment.
7	Document the impact of BS VI (Phase-2) norms on vehicle pollution as an assignment.

8	Collect information on different CNG vehicle in India and prepare a report.
9	Prepare a report Comparing Electric Vehicles, Hybrid Vehicles and Conventional IC engine Vehicles.
10	Collect the emissions data of different vehicle under different conditions and prepare a report.

10. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1	Collection of data/ Material	Limited information	Collects basic information	Collects more information	Collects developed information	Collects a great deal of information	8
2	Quality of data	Irrelevant	Less relevant	Needs improvement	Satisfactory	Very relevant	6
3	Quality of report	Not planned	Less organized	Moderately organized	Organized	As per the standards	4
4	Timely submission	Late submission	Submits after due date	Submits after reminders	Submit after a reminder	On time submission	2
5	Data references	No references.	Irrelevant references.	Given References not from authentic source.	Given references are from authenticated sources.	Enough authenticated references are given.	6
Total Marks= (8+6+4+2+6=26)							26/50

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11. SEE- Model Practice Question Paper

Program	Automobile Engineering		Semester	IV
CourseName	Automobile Fuels and pollution control.	Course Code: 25AT34I	Duration	3 Hrs.
Questions			CO	Marks
1) Conduct an experiment to calculate the Flash and fire point of Diesel			1	50
2) Conduct an experiment to Measure the HC, CO, CO ₂ , and O ₂ using an exhaust gas analyzer.			3	
OR				
1) Conduct an experiment to calculate the calorific value of Diesel fuel using Bomb Calorimeter.			1	
2) Conduct the experiment to service the EGR valve and prepare a trouble shooting chart.			3	
Scheme of assessment:				
a) Procedure writing. 3+3=6				
b) Conduction – 10M, Troubleshoot/ Calculation – 3M and result -2M =10+3+2=15(15x2 =30M)				
c) Viva -voce- 10M				
d) Portfolio evaluation of practical record- 4M				
			Total Marks	50

1) Signature of the Examiner

2) Signature of the Examiner

12. Equipment/software list with Specification for a batch of 30 students

SN	Particulars	Quantity
1	Pensky Martin Flash and Fire point Equipment	2
2	Redwood and Saybolt Viscometer	1
3	Bomb Calorimeter	1
4	Junker's gas Calorimeter	1
5	CNG kit	1
6	2-wheeler fuel feed system	4
7	Diesel engine with all accessories.	2
8	Single cylinder FIP	4
9	Multi Cylinder FIP	2
10	Multi-hole diesel injector	6
11	MPFI petrol engine with all accessories (PCV, EGR, Catalytic converter)	2
12	CRDI diesel engine with all accessories (PCV, EGR, Catalytic convertor, SCR/Particulate filter)	2
13	Turbochargers and Superchargers	2 each
14	MPFI engine injector tester	1
15	Diesel engine injector tester	2
16	FIP Calibrating machine	1
17	Four gas BS-VI Compatible exhaust gas analyser	2
18	BS-VI Compatible Smoke meter	2
19	Catalytic Converter	2
20	Vehicle with micro-hybrid system	1
21	Vehicle full hybrid system.	1



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Automobile Engineering	Semester	IV
Course Name	Hydraulics and pneumatics	Type of Course	Integrated
Course Code	25AT41I	Contact Hours	8 Hrs./week
Teaching Scheme	L: T:P 4:0:4	Credits	6
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale: Many hydraulic and pneumatic systems are used in the control mechanisms of automobiles and machines. Hence it is important to know the concepts of various Hydraulic and Pneumatic systems to troubleshoot the existing systems and to design the new control systems.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Identify the applications of hydraulic and Pneumatic control systems in automobiles.
CO-02	Perform the various testing and maintenance activities of Hydraulic systems.
CO-03	Recreate the hydraulic and Pneumatic circuits used in Automobiles.
CO-04	Perform the various testing and maintenance activities of Pneumatic systems

3. Course Content:

WEEK	CO	PO	Theory	Practice
1	1	1,4	Fluid power engineering – applications, fluid – definition, properties, Bernoulli’s equation-Principle. Pascal’s law with illustrations, Power transmission methods, fluid system- types, block diagrams of hydraulics & pneumatic systems.	Identification of different components of hydraulic and pneumatic circuits. Demonstration of Bernoulli’s Principle. Demonstration of Pascal’s law.
2	1	1,2,3,5	Valves – functions, list types, hydraulic spool valves-types, Pressure control valve, pressure relief valve, counter balance valve, pressure reducing valve, direction control valves – 2/2, 3/2, 4/2, 5/2,	Identification of features of pressure relief valve and Direction control valves. Servicing of different types of valves as per standard procedure. Practice the Safe disposal of used

			5/3 valve.	components and materials.
3	1	1,4	List methods of actuation of Valves, flow control valve- Types, Working of Needle valve, Ball valve and butterfly valve. Working of non-return/check valves and pilot operated sequence valve.	Demonstration of different actuation methods of valves using demo kits/simulations. Demonstration of functions of non-return valve, flow control valve using demo kits/simulations.
4	2	1,2,3,4	Actuators- functions, list types, cylinder type-ram type and piston type- telescopic type, single acting cylinder, double acting cylinder. Rotary actuators – gear, vane, piston type.	Design relevant circuit to demonstrate working of single acting and double acting actuator. Trouble shooting of single acting and double acting actuators.
5	2	1,2,4	Pumps- necessity, classification, construction and working of – external gear, lobe, vane pumps, piston- radial pumps.	Servicing and testing of gear, lobe, and vane pump.
6	3	1,3,4	Accumulators-construction working of weight loaded- spring loaded- gas loaded. Intensifier-need-construction working. Hydraulic circuits, hydraulic symbols, ports – markings and positions.	Design the different types of hydraulic circuits using demo kits/ Simulations
7	3	1,2,3,4	Design of Hydraulic circuits: meter in circuits, meter out circuits, bleed off circuits, accumulator circuits. Regenerative circuits, Pressure reducing circuits. Hydraulic brake & hydraulic Power steering circuits.	Identify the faults for a given hydraulic system, analyze the causes and carry out the preventive measures. Create hydraulic brake circuit and power steering using relevant hydraulic symbols.
8	4	1,2,4	Pneumatics: areas of application, properties of air, humidity. Air compressor- necessity, list types, Working of reciprocating, diaphragm and vane compressor. Requirements of multistage compressor.	Service and test the different types of air compressor.
9	4	1	Reservoirs: Functions. air filter- screen type, bowl type.	Servicing of different types of air filter.

			Pressure regulators- diaphragm type. lubricator, FRL unit.	Maintenance of FRL unit.
10	4	1,2,4	Pneumatic actuators: Necessity, Types. Air suspension- layout and working, Merits & Demerits. Working of Piston type and bellow type air Springs,	Service and testing of different pneumatic actuators. Servicing of different components of air suspension. Troubleshooting of air suspension system.
11	3	1,3	Pneumatic symbols, basic pneumatic circuit- control of double acting cylinder using 4/2 DCV- pilot controlled double acting cylinder 4/2 DCV.	Create pneumatic circuits to control single acting and double acting cylinders.
12	4	1,2	Speed control circuit for double acting cylinder, semi-automatic material handling circuit, time delay circuit, pneumatic tool circuit. Air brake system- layout and working. Working of Air brake valve & brake chamber. Fail safe brake-Need, Layout, Working.	Identification of different components of air brake system. Servicing of brake valve and brake chamber. Trouble shooting of air brake system.
13	3	1,2,3,5	Maintenance of pneumatic systems- Purpose, common faults, preventive measures, and maintenance schedule. Combination circuits: Advantages, Layout & Working of Hydro-pneumatic suspension, Merits & Demerits. Hydro elastic spring-Working. Air over hydraulic brakes-working.	Identify the faults of pneumatic system, analyze the causes and remedies. Create hydro pneumatic suspension circuit and air over hydraulic brake circuit. Appreciate the Safe disposal of used components and materials.

4. References:

Sl. no	Title of book	Author	Publisher
1	Hydraulic and Pneumatic Controls	K.Shanmuga.Sundaram	S.Chand & Co
2	Pneumatic Systems	S.R.Majumdar	Tata McGrawhill
3	Pneumatic Controls	Joji P	Wiley India Pvt Ltd
4	Fluid Power with Applications	Anthony Esposito	Pearson india

5	Hydraulics & Pneumatics	Andrew Parr	Jaico publishing house
6	Fluid Power Transmission & Control	A Alavudeen Khalid Hussain Syed N Shanmugum	Charotor Publisher Anand-388001

5. Web links:

Pascal's Law Demo

<https://www.youtube.com/watch?v=VxLTDtaRCZk>

Basic Hydraulic System

<https://www.youtube.com/watch?v=KgphO-u7MIQ>

Valves

<https://www.youtube.com/watch?v=3RAxRed7QuE>

Spool Valve

<https://www.youtube.com/watch?v=dnVjKV74sAQ>

Hydraulic Lifters

<https://www.youtube.com/watch?v=lorANZ1Tptw>

4/2 Directional Control Valves

<https://www.youtube.com/watch?v=XOYqnLWCYEc>

Pressure Regulating Valve

https://www.youtube.com/watch?v=sFAYW_D3G_g

Pilot Operated Pressure Relief Valve

<https://www.youtube.com/watch?v=q5NV2gBsryk>

Pressure Relief Valve Working

<https://www.youtube.com/watch?v=DAqnpaHf2Qs>

Pressure Reducing Valve

<https://www.youtube.com/watch?v=YgnwuTJB-wc&list=PL9DA65D90A4561300>

Mechanical Control Valve

<https://www.youtube.com/watch?v=HJRE5EfTPcU>

Non Return/Check Valve

<https://www.youtube.com/watch?v=C-8FKgxSg68>

<https://www.youtube.com/watch?v=StHAmZpDHi0>

<https://www.youtube.com/watch?v=XAItnsUcES0&list=PLDaXKeQT8i0ojLE>

[8MMzWQXp1HfeJMqc1](https://www.youtube.com/watch?v=8MMzWQXp1HfeJMqc1)

Pumps

<https://www.youtube.com/watch?v=KM3ivQL6W6w>

<https://www.youtube.com/watch?v=bdib6XwxNuc>

Gear Pump

<https://www.youtube.com/watch?v=c6gwU7IHtlo>

Vane Pump

<https://www.youtube.com/watch?v=BnvzPoNSXCg>

Lobe Pump

<https://www.youtube.com/watch?v=vE7y0EIIrgk>

Actuators

<https://www.youtube.com/watch?v=cScz67tWqCY>

Radial Piston Pump

<https://www.youtube.com/watch?v=a58zzqfF5N0>

Air Compressors

<https://www.youtube.com/watch?v=Ue7BkzBARXw>

FRL Unit

<https://www.youtube.com/watch?v=zPT0YDERfy4>

6. CIE Assessment Methodologies:

Sl. No	CIE Assessment	Test Week (end of)	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					50 Marks

7. SEE - Theory Assessment Methodologies

Sl. No	SEE - Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

Rubrics for Portfolio evaluation

Level of Achievement

Assessment Parameter		Excellent (10)	Very Good (8)	Fair (6)	Poor (4)	Score
AP1	Organization of Report and Timely Submission	Lab report is well organized as directed and submitted on time	Lab report is well organized but not submitted on time	Report contains few errors and not submitted on time them	Poor organization and late submission	
AP2	Knowledge of Tools and Procedures	Demonstrates deep knowledge of tools and procedures; answer the related questions with explanations and elaboration	Adequate knowledge of most tools and procedures; answer the related questions, but fails to elaborate	Superficial knowledge of tools and procedures; able to answer only some of the related basic questions	Lack of information about most of the tools and procedures; cannot even answer basic related questions	
AP3	Team Working Skills	Positive in interacting with all group members, encourages such interaction in others, and always sensitive to the abilities and feelings of others' contributions; Actively helps to identify group goals and works effectively to meet them in assigned roles	Interacts with all group members spontaneously and contributes in a way that is sensitive to the abilities and feelings of others; Demonstrates commitment to group goals and carries out assigned roles effectively	Interacts with other group members if prompted, but sometimes expresses opinions which are insensitive to the abilities and feelings of others; Demonstrates commitment to group goals, but has difficulty performing assigned roles	Rarely interacts within a group, even with prompting, and shows frequent lack of sensitivity to others' feelings and abilities in opinions expressed; Shows little commitment to group goals and fails to perform assigned roles	
AP4	Result Analysis and Data Interpretation	Excellent insight and well-focused results and discussion; Data completely and appropriately interpreted and no overinterpretation	Adequate insight but missed some important points in results and discussion; Interpreted most data correctly but some conclusions may be suspect or over-interpreted	Little insight and analysed only the most basic points; Interpreted some data correctly but significant errors, omissions still present.	No insight and entirely missed the point of the experiment; Little or no attempt to interpret data or overinterpreted data.	
AP5	Task Management	Very Effective in managing the assigned task and allow experimenter(s) to achieve all goals	Somewhat effective in managing the assigned tasks and allow experimenter(s) to achieve most goals.	Somewhat ineffective in managing the assigned task and allow experimenter(s) to achieve only few goals.	Very ineffective and would not allow experimenters to achieve any goals	

8. CIE Theory Test model question paper

Program		Automobile Engineering		Semester - III	
Course Name		Hydraulics and Pneumatics		Test	I/III
Course Code		25AT41I	Duration	90 min	Marks
				50	
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					
Q.No	Questions	Cognitive Level	Course Outcome	Marks	
Section - 1					
1	a) List the types of valves and state the functions. 5M b) Illustrate Pascal's law with an example. 10M c) Explain with a neat sketch pressure control valve.10	L2	1	25	
2	a) State the applications of Fluid power engineering.5M b) Draw the block diagrams of Hydraulics and Pneumatics. 10M c) Explain with a neat sketch counter balance valve. 10	L2	1	25	
Section – 2					
3	a) List the classification of pumps. 5M b) Explain with a neat sketch vane type of actuator.10M c) Explain with a neat sketch external gear pump.10M	L3	2	25	
4	a) List the functions of Actuators. 5M b) Explain with a neat sketch rotary type of actuator.10M c) Explain with a neat sketch a radial piston pump. 10M	L3	2	25	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.					

Signature of the Course Coordinator

HOD

IQAC

9. CIE Practice Test model question paper

Program	Automobile Engineering		Semester	IV	
Course Name	Hydraulics and Pneumatics		Test	II	
Course Code	25AT41I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions			CO	Marks	
1. Demonstrate Pascal's law			1	50	
2. Design relevant circuit to demonstrate the working of single acting actuator.			2		
OR					
3. Demonstrate actuation methods of different valves using demo kits.			1		
4. Design relevant circuit to demonstrate working of double acting actuator.			2		
Scheme of assessment					
a) Procedure writing- 3+3=6					
b) Conduction/troubleshoot/calculation and results- 10+3+2 (15 x 2 experiments = 30)					
c) Viva voce - 10					
d) Portfolio evaluation of practical record – 4					
Total Marks				50	

Signature of the Course Coordinator

HOD

IQAC

10. Suggestive Activities for Tutorials:

The List is an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic

Sl.No.	Suggestive Activities for Tutorials
01	Draw hydraulic circuits used in Automobile's, construction vehicles and garage equipment/machines.
02	Draw pneumatic circuits used in Automobile's, construction vehicles and garage equipment/machines.
03	Create different hydraulic circuits used in construction and agricultural vehicles.
04	Prepare a report on different hydraulic circuits used in hydraulic excavator.
05	Prepare a report on hydraulic drive motor control used in road roller.
06	Create different pneumatic circuits used in automobile.

11. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1	Collection of data/ Material	Limited information	Collect basic information	Collect more information	Collects developed information	Collects a great deal of information	8
2	Quality of data	Irrelevant	Less relevant	Needs improvement	Satisfactory	Very relevant	6
3	Quality of report	Not planned	Less organized	Moderately organized	Organized	As per the standards	4
4	Timely submission	Late submission	Submits after due date	Submits after reminders	Submit after a reminder	On time submission	2
5	Data references	No references.	Irrelevant references.	References not from authentic source.	Given references are from authenticated sources.	Enough authenticated references are given.	6
Example: Average Marks= (8+6+4+2+6=26)							

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

12. Equipment/software list with Specification for a batch of 30 students.

Sl. No.	Particulars	Specification	Quantity
1	Hydraulic trainer Kit	Trainer Kit	2
2	Hydraulic Power steering trainer kit	Trainer Kit	2
3	Hydraulic brake trainer kit		2
4	Hydraulic Gear Pump, G-rotor Pump, Lobe pump, Vane pump		2 each
5	Hydraulic Actuators	Single acting and Double acting	2 Each
5	Flow control valves	Ball valve, Gate type.	2 each
6	Pressure relief valve	Spring loaded type	2
7	Direction control valve	2/2,3/2,4/3/4/3	2 each
8	Pneumatic trainer kit		2
9	Air compressor	Double stage (200 Litr)	1
10	Air compressor	Reciprocating type, Diaphragm type	2 each
11	Pneumatic Rams	Single cylinder & double cylinder	2 each
12	Pneumatic Direction control Valves	2/2,3/2,4/3/4/3	2 each
13	Pneumatic pressure relief valves	Spring loaded type	2 each
14	Air suspension trainer kit		2
15	Air Brake trainer kit		2
16	Air Brake chambers	Single Chamber, Double Chamber & Triple chamber type	2 each
17	Air brake valve		2
18	Air over hydraulic brake trainer kit		2
19	Simulation software's	Free and open source	1 each



**Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION**

Program	Automobile Engineering	Semester	IV
Course Name	Advanced Automotive Systems	Type of Course	Theory
Course Code	25AT42I	Contact Hours	8 hours/week
Teaching Scheme	L: T:P- 4:0:4	Credits	6
CIE Marks	50	SEE Marks	50 (Theory)

1. Rationale:

The modern automobile systems are controlled by various sensor and actuators. Hence the students should be able to justify the use of different sensors and actuators adopted in advanced electrical and mechanical systems used in automobile. The students should perform service activities related to sensors and actuators used in advanced electrical and mechanical systems of automobile.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Perform the testing and troubleshooting of different sensors and actuators.
CO-02	Perform the troubleshooting activities of the advanced transmission and steering system.
CO-03	Perform the troubleshooting activities of advanced safety and stability systems.
CO-04	Perform the troubleshooting activities of battery vehicle and their components.

3. Course Content:

Week	CO	PO	Theory (4 Hours per week)	Practice (4 Hours per week)
1	1	1,2,4	Sensors -types. Actuators-list types, electronic control systems-need-merits and demerits-types. – comparison. Microcontroller /ECM-need-layout of typical ECM-functions of each component of ECM. Working of ECM. Networking-concept, Multiplexing-concept, CAN-concept.	Identify location of different ECMs used in automobile. Practice on safe removal and reconnection of different connections to ECM. Identification of different components and pin configurations of typical automobile ECM. Identify ECM related problems, reasons and suggest remedies.
2	1	1,2,4	TDC/RPM sensors-function-types-construction and working of Hall-effect and electromagnetic type, circuit diagrams showing connection of these sensors to ECM.	Identification of TDC/RPM and temperature sensor location. Practice on removal and refitting of TDC/RPM sensor and temperature sensor. Practice on testing of TDC/RPM sensor

			Temperature sensor-functions - construction and working- circuit diagram showing connection of this sensor to ECM.	and temperature sensor. Identify TDC/RPM sensor and temperature sensor related problems, reasons and suggest remedies.
3	1	1,2,4	Manifold pressure sensor-need-types-construction and working of MAP and MAF sensor-circuit diagrams showing connection of above sensors to ECM. Knock sensor-need-construction and working-circuit diagram showing the connection to ECM.	Identification of location of MAP, MAF and knock sensor. Practice on removal and refitting of MAP, MAF and knock sensor. Practice on testing of above sensor. Identify MAP/MAF sensor and Knock sensor related problems, reasons and suggest remedies.
4	1	1,2,4	Throttle position sensor-functions-construction working-circuit diagram showing the connection to ECM. Exhaust gas oxygen sensor-functions-construction and working-circuit diagram showing connection to ECM.	Identification of location of TPS, and EGO sensor. Practice on removal and refitting of TPS and EGO sensor. Practice on testing of these sensor. Identify TPS sensor and EGO sensor related problems, reasons and suggest remedies.
5	1	1,2,4	Ride height sensor-potentiometer type and LVDT type-functions-construction and working-circuit diagram showing connection of these sensor to ECM. Rain sensor-function-list types-construction and working of infrared type rain sensor.	Identification of location of ride height, and rain sensor. Practice on removal and refitting of ride height and rain sensor. Practice on testing of these sensor. Identify ride height sensor and rain sensor related problems, reasons and suggest remedies.
6	1	1,2,4	Impact sensor-functions-types-construction and working of magnetic bias and rolamite sensor. On/off solenoid-functions-construction and working of on/off solenoid. Relay-functions-construction and working of relay.	Identification of location of impact sensor. Practice on removal and refitting of impact sensor. Practice on testing of impact sensor. Identify ride impact sensor related problems, reasons and suggest remedies. Practice on servicing of solenoid and relay.
7	1	1,4	Pulse width Modulation-Need-Duty cycle. proportional solenoid-construction and working-applications.	Identify the location of proportional solenoid. Practice on controlling a motor/brightness of bulb using pulse width modulation.

			Stepper motor-construction and working-applications. Servomotor-construction and working-applications.	Practice on servicing and testing proportional solenoid. Practice on servicing and testing of stepper and servo motors.
8	2	1,2,4	Automated manual transmission-layout-working-merits and demerits. Continuously variable transmission-construction and working-merits and demerits. Torque converter-working-merits-demerits, Torque converter lock up-list types-construction and working of centrifugal and double clutch type lock ups.	Removal and refitting of components of continuously variable transmission. Removal and refitting of automated manual transmission components. Trouble shooting of Continuously variable and automated manual transmission.
9	2	1,2,4	Hydraulic automatic transmission-working. dual clutch transmission-working. Viscous coupling-working, limited slip differential-need-types-working of clutch type limited slip differential.	Removing and refitting different components of hydraulic automatic transmission. Removal and refitting of different components of limited slip differential. Trouble shooting of hydraulic automatic transmission.
10	2	1,2,4	Four-wheel drive System-Merits-Demerits-List types-layout of part-time four-wheel drive system and four-wheel drive system using viscous coupling. Electric power steering-list types-construction and working of column mounted type electric power steering.	Identification of parts of four wheel drive system. Practice on servicing of transfer gear box. Practice on servicing of electric power steering. Trouble shooting of electric power steering.
11	3	1,2,4	Antilock brake system-need-layout-hydraulic modulator-construction working. Air bag system-need-layout-working. Collison avoidance system-need-layout-working.	Identification of antilock brake system components. Servicing of different components of antilock brake system. Identification of different components of air bag system. Trouble shooting of antilock brake system.
12	3	1,4	Computerised instrumentation system-layout-merits. electronic stability control system-need-layout. Traction control system-need-layout. Autonomous vehicle/driver less vehicle-layout-merits-demerits.	Removal and refitting of components of instrumentation system. Identification of components of electronic stability, traction control system and autonomous vehicle.
13	4	1,2,4	Electric vehicle-layouts of different	Identification of different components of

		<p>drive configurations-working.</p> <p>Battery management system, battery pack construction, brushless DC motor working-speed control, AC synchronous motor working-speed control.</p> <p>Regenerative braking-layout-working using both BLDC and AC synchronous motors-merits and demerits.</p>	<p>battery vehicles.</p> <p>Safe removal of components of battery vehicle and refitting.</p> <p>Servicing of BLDC and A.C synchronous motors.</p> <p>Demonstration of electric vehicle using demo model/ test rigs.</p> <p>Trouble shooting of electric vehicle.</p>
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4. References:

1. Understanding Automotive electronics, William Ribbon, Butterworth-Heinemann Publications
2. Automotive Computer Controlled Systems (Diagnostic tools and techniques),
3. Automobile electrical and electronic systems, Tom Denton, Butterworth-Heinemann Publications
4. Electronic Engine Controls, Steve. V. Hatch, Cengage Learning
5. Truck engines Fuel & computerized management systems, Sean Bennett, Cengage Learning.
6. Modern Electric, Hybrid Electric and Fuel Cell Vehicles by Mehrdad Ehsani, Yimin Gao and Ali Emadi, CRC Press.
7. Electric Motors and Drives BY AUSTIN HUGHES and BILL DRURY
8. Electric and Hybrid Vehicles by Tom Denton, Routledge, 2016.

Rubrics for Portfolio evaluation

Level of Achievement

Assessment Parameter		Excellent (10)	Very Good (8)	Fair (6)	Poor (4)	Score
AP1	Organization of Report and Timely Submission	Lab report is well organized as directed and submitted on time	Lab report is well organized but not submitted on time	Report contains few errors and not submitted on time them	Poor organization and late submission	
AP2	Knowledge of Tools and Procedures	Demonstrates deep knowledge of tools and procedures; answer the related questions with explanations and elaboration	Adequate knowledge of most tools and procedures; answer the related questions, but fails to elaborate	Superficial knowledge of tools and procedures; able to answer only some of the related basic questions	Lack of information about most of the tools and procedures; cannot even answer basic related questions	
AP3	Team Working Skills	Positive in interacting with all group members, encourages such interaction in others, and always sensitive to the abilities and feelings of others' contributions; Actively helps to identify group goals and works effectively to meet them in assigned roles	Interacts with all group members spontaneously and contributes in a way that is sensitive to the abilities and feelings of others; Demonstrates commitment to group goals and carries out assigned roles effectively	Interacts with other group members if prompted, but sometimes expresses opinions which are insensitive to the abilities and feelings of others; Demonstrates commitment to group goals, but has difficulty performing assigned roles	Rarely interacts within a group, even with prompting, and shows frequent lack of sensitivity to others' feelings and abilities in opinions expressed; Shows little commitment to group goals and fails to perform assigned roles	
AP4	Result Analysis and Data Interpretation	Excellent insight and well-focused results and discussion; Data completely and appropriately interpreted and no over interpretation	Adequate insight but missed some important points in results and discussion; Interpreted most data correctly but some conclusions may be suspect or over-interpreted	Little insight and analysed only the most basic points; Interpreted some data correctly but significant errors, omissions still present.	No insight and entirely missed the point of the experiment; Little or no attempt to interpret data or over interpreted data.	
AP5	Task Management	Very Effective in managing the assigned task and allow experimenter(s) to achieve all goals	Somewhat effective in managing the assigned tasks and allow experimenter(s) to achieve most goals.	Somewhat ineffective in managing the assigned task and allow experimenter(s) to achieve only few goals.	Very ineffective and would not allow experimenters to achieve any goals	

5. CIE and SEE Assessment Methodologies:

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	Average of all CIE=50 Marks
1.	CIE-1TheoryTest	4	90	50	
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					50 Marks

6. SEE - Theory Assessment Methodologies

Sl. No	SEE - Theory Assessment	Duration	Exam Paper Max marks	Exam Paper Max Marks scale down to (Conversion)	Min marks to pass
1.	Semester End Examination-Theory	3 Hours	100	50	20

7. CIE Theory Test model question paper:

Program	Automobile Engineering			Semester IV		
Course Name	Advanced Automotive Systems			Test	I	
Course Code	25AT42I	Duration	90 min	Marks	50	
Name of the Course Coordinator:						
Note: Answer any one full question from each section. Each full question carries 25 marks.						
Q. No	Questions			Cognitive Level	Course Outcome	Marks
Section - 1						
1	a) List the merits and demerits of electronic control systems.5M b) Explain with a neat sketch working of temperature sensor. 10M c) Draw the layout of microcontroller and label the parts. 10M			L2	1	25
2	a) Explain the concept of multiplexing. 5M b) Explain with a circuit diagram working of Hall effect sensor.10M c) Explain with a circuit diagram working of Electromagnetic type RPM sensor. 10M			L2	1	
Section - 2						
3	a) With a block diagram, show how different sensors are connected to the ECM. 5M b) Explain with a circuit diagram working of manifold pressure sensor. 10M c) Explain with a circuit diagram working of throttle position sensor. 10M			L3	1	25
4	a) State the functions of exhaust gas oxygen sensor. 5M b) Explain with a circuit diagram working of MAF sensor. 10M c) Sketch the circuit diagram of Knock sensor with its working.10M			L3	1	
Note: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.						

Signature of the Course Coordinator

Signature of the HOD

Signature of the IQAC

8. CIE Practice Test

Program	Automobile Engineering		Semester	IV	
CourseName	Advanced Automotive Systems		Test	II	
Course Code	25AT42I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions		CL	CO	Marks	
9. Identify the locations of various ECMs used in automobiles.		L1	1	50	
10. Remove MAF sensor, test and refit the same.		L3			
OR			1	50	
11. Identify the location of rain sensor, remove, test and refit the same.		L1			
12. Remove EGO sensor, test and refit the same.		L3			
Scheme of assessment					
a) Procedure writing- 3+3=6					
b) Conduction-10M/troubleshoot or calculation-03M/results-02M, (15 x 2 experiments = 30)					
c) Viva voce - 10					
d) Portfolio evaluation of practical record – 4					
Total Marks				50	

Signature of the Course Coordinator

Signature of the HOD

9. Suggestive Activities:

The List is only shared as an Example and not inclusive of all possible activities of the course. Student and Faculty are encouraged to choose activities that are relevant to the topic and on the availability of such resources at their institution. **Two activities**, each for **50 marks** should be evaluated with proper rubrics.

Sl. No.	Suggestive Activities for Tutorials
01	Open an ECU from a vehicle and reconnect as per the pin configuration.
02	Study and give a presentation on CAN.
03	Make a list of various sensors used in a vehicle with their position and submit it as an assignment.
04	Make a list of various actuators used in a vehicle with their position and submit it as an assignment.
05	Study and present on parking assist system.
06	Visit nearby workshop and know the working of AMT.
07	Study and present on construction and working of electrical power steering.
08	Prepare a report on working of different types of ABS system.

09	Prepare a presentation on working principle and actuation of air bags.
10	Prepare a simple working model of regenerative braking showing the working principle it.
11	Make a group of 5 and visit nearest showroom discuss on the topic battery life, cost of replacement, recycling of batteries in EV and write a report on the observed data.
12	Visit an electric vehicle service station and identify the location of various 2-wheeler and 4-wheeler electric components.
13	Dismantle DC and BLDC motors, know the physical differences and working principle and prepare a report on it.

10. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1	Collection of data/ Material	Limited information	Collects basic information	Collects more information	Collects developed information	Collects a great deal of information	8
2	Quality of data	Irrelevant	Less relevant	Needs improvement	Satisfactory	Very relevant	6
3	Quality of report	Not planned	Less organized	Moderately organized	Organized	As per the standards	4
4	Timely submission	Late submission	Submits after due date	Submits after reminders	Submit after a reminder	On time submission	2
5	Data references	No references.	Irrelevant references.	Given References not from authentic source.	Given references are from authenticated sources.	Enough authenticated references are given.	6
Example: Average Marks=(8+6+4+2+6)=26							26/50

Note: a) Dimension and Descriptor shall be defined by the respective course coordinator as per the activities
b) Activities should be typed report.

11. Equipment/software list with Specification for a batch of 30 students

SN	Particulars	Specification	Quantity
1	Multi-cylinder Engine with Electronic control unit and different engine sensors.	Multi-cylinder Engine with Electronic control unit and different engine sensors.	01
2	ECUs of other vehicle systems (ABS, Transmission)	ECUs of other vehicle systems (ABS, Transmission)	01
3	Throttle position sensors / kit, crank shaft position sensor (Magnetic pickup coil type, Hall type)/kit, exhaust gas sensor/kit, mass flow sensor, LVDT height sensors, rain sensor, knock sensor and temperature sensor, Potentiometer.	Throttle position sensors / kit, crank shaft position sensor (Magnetic pickup coil type, Hall type)/kit, exhaust gas sensor/kit, mass flow sensor, LVDT height sensors, rain sensor, knock sensor and temperature sensor, Potentiometer.	02
4	Solenoid stepper motor demo kit.	Solenoid stepper motor demo kit.	01
5	Automatic hydraulic transmission with Torque converter.	Automatic hydraulic transmission with Torque converter.	01
6	Automated manual transmission.	Automated manual transmission.	01
7	Continuously variable transmission	Continuously variable transmission	02
8	Electrical power steering trainer unit.	Electrical power steering trainer unit.	01
9	ABS trainer unit.	ABS trainer unit.	01
10	Air bag trainer unit.	Air bag trainer unit.	01
11	Limited Slip differential	Limited Slip differential	01
12	Electric Vehicle	2-wheeler. Motor Power 1200 – 1800 W Motor Type – BLDC Drive Type - Hub Motor Battery Type - Li-ion Battery Capacity 72 V/26 Ah	01
13	Electric Vehicle	4-wheeler. Engine Type – 3 Phase Induction Motor Max Power – 25.5 BHP @3750 rpm Max Torque – 53 Nm@ 0- 3500 rpm	01
14	Hybrid Electric Vehicle – 4-wheeler.	Demo/ test models	01
15	Battery testing kit.	Voltage 6 V to 60 V	01
16	Lithium-Ion Battery Charger.	Input Voltage: 180-250 V AC Output Voltage: DC 54.6V Application: Suitable for 48V E-Bike Batteries Output Current: 3-4 A	01
17	Brushless DC Motor	Brushless DC Motor	01
18	Electric Vehicle Control Unit.	Electric Vehicle Control Unit.	01



Government of Karnataka
DEPARTMENT OF TECHNICAL EDUCATION

Program	Automobile Engineering	Semester	IV
Course Name	Vehicle body engineering and dynamics.	Type of Course	Integrated
Course Code	25AT43I	Contact Hours	7 hrs./week
Teaching Scheme	L: T:P 3:0:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale: The safety, ergonomics and efficiency of the vehicle are important parameters in design of vehicle body. Hence the student should be able to appreciate concepts of safety, ergonomics and efficiency of car body. The student should perform various repair activities on vehicle body.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Perform repair activities on vehicle body and paint with appropriate equipment and procedure.
CO-02	Perform service activities of vehicle safety and comfort systems,
CO-03	Calculate amount of power required for propulsion and vehicle performance parameters under different operating conditions of vehicle.
CO-04	Calculate different vehicle braking performance parameters under different operating conditions.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1	1,4	Car body -functions, requirements, classification based on body style, classification based on engine and drive wheel position-layout of each type-merits and demerits of each type.	Identification of different types of body style. Identification of different chassis components. Identification of different components of car body parts.

2	1	1,4	<p>Parts of body-construction of each part-functions of each part. - materials used.</p> <p>Visibility-concept-methods to improve visibility. Sources of noise and vibrations-methods to reduce noise and vibrations.</p>	Removing and refitting of front and rear bumper, front and rear bonnet, front left and right wings.
3	1	1,4	<p>Car body construction-list types-process of unitary body construction.</p> <p>Welding-list types, arc welding-types-components of arc welding-arc welding process.</p> <p>Gas welding-components of gas welding process-gas welding process-types of flame and their applications.</p>	<p>Practice on creating but, lap and T-joints using arc welding process.</p> <p>Practice on creating a tray and a funnel using sheet metal and join edges using gas welding process.</p> <p>Practice on producing three types of flames.</p>
4	1	1,4,5	<p>Car painting-objectives-elements of paint-functions of each element of paint, painting methods-list types-air spray painting, air less spray painting, electrostatic painting.</p>	<p>Practice on removing of dent from panels.</p> <p>Practice on preparing body panels for painting.</p> <p>Practice on painting the body panels using any method of painting.</p>
5	2	1,4,5	<p>Passenger Safety-passive and active safety systems-crumple zones-passenger cage-impact energy flow, seat belt-types-working of three-point seat belt, collapsible steering-types-construction-telescopic and mesh type, pedestrian safety-methods to improve pedestrian safety.</p>	<p>Identification of passive safety systems of car.</p> <p>Removing and refitting of seat belts.</p> <p>Remove and refit steering columns from vehicle.</p>
6	2	1,4	<p>Ergonomics -concept-methods to improve ergonomics, Types of seats, Bucket seat construction and position adjustments, steering column tilt and reach adjustment mechanism, Doors-types-door glass operating mechanism-types-manual.</p>	<p>Remove and refit seats from the vehicle.</p> <p>All door removal and refitting.</p> <p>Servicing of manual door glass operating mechanism.</p>
7	2	1,4	Electrical front door glass	Servicing of electrical door glass

			operating mechanism, central locking mechanism, remote control-concept-layout. Wind shield glass-need-types-laminated glass-need-construction. Defrosting-need-working.	operating mechanism. Servicing of central locking system. Replacement of wind shield glass.
8	2	1,4,5	Car air conditioning-need-layout-working. Crash Testing-Need-List types-procedure to conduct crash testing as per Bharat NCAP. Meaning of crash safety ratings as per the NCAP.	Trouble shooting of A.C system. Removing and refilling of refrigerant.
9	3	1,2,3	Aerodynamic forces acting on car body, methods to reduce car aerodynamic drag. Different resistances to car motion. Air resistance-rolling resistance, gradient resistance, power required for propulsion.	Find air resistance, rolling resistance, gradient resistance and power required for propulsion for different vehicle speed, road surface, and gradients. (Solve simple problems)
10	3	1,2,3	Relation between engine speed and vehicle speed, traction, tractive effort, maximum acceleration, gradability, and draw bar pull, equivalent weight, weight distribution for car on slope.	Find vehicle speed, tractive effort, acceleration, gradability, and draw bar pull under different engine speed gear ratios and vehicle weight. (Solve simple problems)
11	3	1,2,3	Maximum acceleration, tractive effort and road reactions under different drive conditions.	Calculation of maximum acceleration, tractive effort and road reactions under different drive conditions, different road and vehicle dimensions. (solve simple problems)
12	4	1,2,3,4	Braking efficiency, stopping distance, Theory of internal shoe brakes, mean lining pressure and heat generation, Trailing and leading shoes-concept-applications	Calculation of braking torque, mean lining pressure and heat generation under different brake drum dimensions, braking force, material and type of shoe. (solve simple problems) Practice on finding braking distance and braking efficiency on different

				conditions of road and vehicle.
13	4	1,2,3	Road reactions and deceleration of vehicle on moving on slope with only front brakes applied, rear brakes applied and all brakes applied.	Find road reactions and deceleration of vehicle under different road conditions and with different dimensions of vehicle. (solve simple problems)

4. References:

Sl.No.	Title of Books	Author	Publication
1.	Automotive Engineering (Heating & Air conditioning) class room manual	Mark Schnabel Cengage Learning	Cengage Learning.
2.	Automobile Engineering vol VI (Air Conditioning System)	Anil Chikara	Cengage Satya Prakashan New Delhi
3	Automobile Engineering	Ramalingam K. K	
4	Automobile Engineering vol IV	Anil Chikara	Satya Prakashan New Delhi
4.	Vehicle Body Repair by James Duffy	J.M. Duffy	Cengage Learning
5	Automobile Engineering (Paint Technology) vol V	Anil Chikara	Satya Prakashan New Delhi
6	Vehicle Body Engineering	Pawlowski. J.,	
7	Body construction and design	Giles. J.C	
8	Vehicle Body layout and analysis	John Fenton	Mechanical Engineering Publication Ltd., London, 1982
9	Vehicle Body building and drawing	Braithwaite J. B	Heinemann Educational Books Ltd., London
10	Automotive Mechanics	Grouse W and Anglin D	Tata McGraw Hill Publication 10th edition, 2004

11. Rubrics for Portfolio evaluation

Level of Achievement

Assessment Parameter		Excellent (10)	Very Good (8)	Fair (6)	Poor (4)	Score
AP1	Organization of Report and Timely Submission	Lab report is well organized as directed and submitted on time	Lab report is well organized but not submitted on time	Report contains few errors and not submitted on time them	Poor organization and late submission	
AP2	Knowledge of Tools and Procedures	Demonstrates deep knowledge of tools and procedures; answer the related questions with explanations and elaboration	Adequate knowledge of most tools and procedures; answer the related questions, but fails to elaborate	Superficial knowledge of tools and procedures; able to answer only some of the related basic questions	Lack of information about most of the tools and procedures; cannot even answer basic related questions	
AP3	Team Working Skills	Positive in interacting with all group members, encourages such interaction in others, and always sensitive to the abilities and feelings of others' contributions; Actively helps to identify group goals and works effectively to meet them in assigned roles	Interacts with all group members spontaneously and contributes in a way that is sensitive to the abilities and feelings of others; Demonstrates commitment to group goals and carries out assigned roles effectively	Interacts with other group members if prompted, but sometimes expresses opinions which are insensitive to the abilities and feelings of others; Demonstrates commitment to group goals, but has difficulty performing assigned roles	Rarely interacts within a group, even with prompting, and shows frequent lack of sensitivity to others' feelings and abilities in opinions expressed; Shows little commitment to group goals and fails to perform assigned roles	
AP4	Result Analysis and Data Interpretation	Excellent insight and well-focused results and discussion; Data completely and appropriately interpreted and no over interpretation	Adequate insight but missed some important points in results and discussion; Interpreted most data correctly but some conclusions may be suspect or over-interpreted	Little insight and analysed only the most basic points; Interpreted some data correctly but significant errors, omissions still present.	No insight and entirely missed the point of the experiment; Little or no attempt to interpret data or over interpreted data.	
AP5	Task Management	Very Effective in managing the assigned task and allow experimenter(s) to achieve all goals	Somewhat effective in managing the assigned tasks and allow experimenter(s) to achieve most goals.	Somewhat ineffective in managing the assigned task and allow experimenter(s) to achieve only few goals.	Very ineffective and would not allow experimenters to achieve any goals	

5. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	
1.	CIE-1TheoryTest	4	90	50	Average of all CIE=50 Marks
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
Total					50 Marks

6. SEE – Practice Assessment Methodologies

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

7. CIE Theory Test model question paper

Program	Automobile Engineering			Semester -IV	
Course Name	Vehicle body engineering and dynamics.			Test	I
Course Code	25AT43I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					
Q. No	Questions		Cognitive Level	Course Outcome	Marks
Section - 1					
1	a) Write the classification of car bodies.	10M	L2	1	25
	b) List the methods to improve visibility.	05M	L2		
	c) Illustrate the arc welding process.	10M	L2		
2	a) List the requirements of car body.	05M	L2	1	
	b) Explain the front engine and front wheel drive system	10M	L2		
	c) Illustrate gas welding process.	10M	L2		
Section - 2					
3	a) List the functions of car paint.	05M	L3	1	25
	b) Explain the process of air spray painting.	10M			
	c) Explain the different parts of car body with a sketch.	10M			
4	a) List sources of noise and vibration from vehicle.	05M	L3	1	
	b) Explain the functions of each component of paint.	10M			
	c) Explain the process electrostatic car painting.	10M			
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.					

Signature of the Course Coordinator

HOD

IQAC Chairman

8. CIE Practice Test model question paper

Program	Automobile Engineering		Semester	IV	
Course Name	Vehicle body engineering and dynamics.		Test	II/IV	
Course Code	25AT43I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions			CO	Marks	
a. Remove and refit the front bumper of a given car using proper tools and procedure.			1	50	
b. Service the central locking system of the given car.			2		
OR					
c. Paint the given body part of the car using air painting process with proper procedure.			1		
d. Service the electrical door operating mechanism of the given car.			2		
Scheme of assessment					
a) Procedure writing- 3+3=6M				6	
b) Conduction-10M, troubleshoot/calculation-3M and results-2M, ((10+3+2=15), 15 x 2 experiments = 30M)				30	
c) Viva voce – 10M				10	
d) Portfolio evaluation of practical record – 4M				04	
Total Marks				50	

Signature of the Course Coordinator

Signature of the HOD

9. Suggestive Activities for Tutorials:

The List is an Example and not inclusive of all possible activities of the course. Students and Faculty are encouraged to choose activities that are relevant to the topic. Two activities, each for 50 marks should be evaluated with proper rubrics.

Sl.No.	Suggestive Activities for Tutorials
01	Collect information on different vehicle bodies with photographs and specifications.
02	Collect information on different advanced paints and painting process.
03	Collect information on different tools and equipment used in body repair shops.
04	Collect information on different paint components used in car body painting shops.
05	Collect information on different advanced body repair process
06	Collect information on different advanced metal joining process.
07	Collect information on advance safety and comfort systems of vehicle.

10. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Students Score
		2	4	6	8	10	
1	Collection of data/ Material	Limited information	Collects basic information	Collects more information	Collects developed information	Collects a great deal of information	8
2	Quality of data	Irrelevant	Less relevant	Needs improvement	Satisfactory	Very relevant	6
3	Quality of report	Not planned	Less organized	Moderately organized	Organized	As per the standards	4
4	Timely submission	Late submission	Submits after due date	Submits after reminders	Submit after a reminder	On time submission	2
5	Data references	No references.	Irrelevant references.	Given References not from authentic source.	Given references are from authenticated sources.	Enough authenticated references are given.	6
Example: Total= (8+6+4+2+6=26)							26/50

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

11. SEE- Model Practice Question Paper

Program	Automobile Engineering		Semester	IV
Course Name	Vehicle body engineering and dynamics.	Course Code: 25AT43I	Duration	180 min
Questions			CO	Marks
1. Paint the given car body part with specified painting method following proper procedure.			1	50
2. Find road reactions and acceleration of vehicle under given road conditions and with given dimensions of vehicle. (Give specific data for problem solving)			3	
OR				
1. Remove the front left apron from the car, remove dents and refit to the car using proper tools.			1	
2. Find air resistance, rolling resistance, gradient resistance and power required for propulsion for given vehicle speed and other specified vehicle parameters. (Give specific data for problem solving)			3	
Scheme of assessment for practical questions.				3
a) Procedure writing- 3				
b) Conduction-10M, troubleshoot/calculation-3M and results-2M, Total= (3+10+3+2=18)				15
Scheme of assessment for problem questions.				
Given data-03M, Formulae-03M, Calculation-10M, Results-02M, Total= ((3+10+3+2=18)				18
e) Viva voce – 10M				10
f) Portfolio evaluation of practical record – 4M				04
Total Marks				50

Signature of the Examiner

Signature of the Examiner

12. Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
01	Major mechanic tool kit		2
02	Two post vehicle lift	Electrically operated suitable to lift up to 5-ton vehicle.	1
03	Tripod stands	Carry capacity 1 ton	8
04	Body repair tools kit	Panel Beaters / Hammers, Shrinking Hammers, Body Hammers (soft-faced, flat, or round head, Slide Hammer, Dolly Blocks (Suitable for all type of dent removals)	2 set
	Manual Dent Pullers		2
	Pneumatic Dent Pullers		2
05	An unserviceable car with all body parts.	A typical mid-size car	2
06	Angle Grinders		2
07	Die Grinders		
08	Electrical body polishing tools.	Electrical Sanding and buffing tools	1 set
09	A paint booth	Controlled environmental booth with Heating, drying, cleaning controls suitable for a mid-size sedan.	1
10	Air compressor	Double stage, electrically operated, mounted on air tank, tank capacity-200liters	1
11	Paint spray gun	Half liter's capacity, spray angle and pressure adjustments.	2
12	Car AC servicing equipment	Leakage test, refrigerant removal and refilling	1



Government of Karnataka
DEPARTMENT OF TECHNICAL
EDUCATION

Program	Automobile Engineering	Semester	IV
Course Name	Machine design and drafting	Type of Course	Integrated
Course Code	25AT44I	Contact Hours	7 Hrs./week
Teaching Scheme	L: T:P, 3:0:4	Credits	5
CIE Marks	50	SEE Marks	50 (Practice)

1. Rationale: Machine design, parametric modelling, geometric tolerance and dimensioning are important part of modern designing process. The student should learn the concepts of machine design and gain skills in parametric modelling.

2. Course Outcomes: At the end of the Course, the student will be able to:

CO-01	Perform experiments and calculations to find different material and shape related parameters required to design machine elements.
CO-02	Apply appropriate geometric tolerance and dimensioning symbols to machine drawings using free and open-source software.
CO-03	Design and create solid part models and assemblies of different machine elements using standard procedures.
CO-04	Design and create solid part models and assemblies of different Automotive Engine components using standard procedures.

3. Course Content

WEEK	CO	PO	Theory	Practice
1	1		Machine design -introduction, types, process. Force, Torque, couple, loads-types. Simple stress and strains – Tensile stress and compressive stress. Hooke’s law, Young’s modulus. Shear stress and strain, Shear modulus or modulus of rigidity. Stress-strain diagram. Working stress, Factor of safety-definition, purpose.	Conduct the tensile test on mild steel using UTM and plot the stress-strain diagram. Conduct the Compression test on Cast iron using UTM and plot the stress-strain diagram.
2	1		Linear and Lateral Strain, Poisson's Ratio. Volumetric strain, Bulk modulus. Resilience. Centre of gravity & moment of Inertia – concept, Importance.	Practice to find the Centre of gravity and moment of inertia of L section, I Section and Box section using analytical method and free and open-source software/simulation.

3	2		<p>Limits-Need for limit system. Fit-Types of Fit – Clearance fit, interference fit, transition fit and their designation.</p> <p>Allowance, Tolerance – System of Tolerance-shaft based and hole-based dimensions (system of writing tolerance). Unilateral system and bilateral system.</p>	<p>Practice to insert different fit, tolerance, precision, and limit symbols using free and open-source software.</p> <p>Identify the different types of fit and tolerances in automobile components drawings.</p>
4	3		<p>Fasteners-types, applications. Initial stresses in screw fastenings, Stresses induced in a bolt subjected to external load, simple problems.</p>	<p>Create the part models of square nut and bolt, assemble using free and open-source software.</p> <p>Create the part models of hexagonal nut and bolt, Assemble using free and open-source software.</p>
5	1		<p>Shafts- Types, Materials, standard sizes of transmission shaft, applications. Stresses in Shafts, Design of Shafts subjected to twisting and bending only. Simple problems.</p>	<p>Identify different types of shafts used in Automobile vehicles and list the materials.</p> <p>Conduct the torsion test on mild steel using torsion testing machine or virtual lab.</p>
6	3		<p>Keys- need, types. Design of sunk key- forces acting on sunk key, strength of sunk key. Simple problems.</p>	<p>Identify the different types of keys and key ways used in industry.</p> <p>Create the part model of different types of keys using free and open-source software.</p>
7	3		<p>Couplings-Purpose, requirements-Types, Applications. Design of unprotected-flange coupling. Simple problems.</p>	<p>Create the part models of Muff coupling and assemble using free and open-source software.</p> <p>Create the part models of Unprotected type Flange coupling and assemble using free and open-source software.</p>
8	3		<p>Springs – Types, Materials. Helical spring- Applications, End connections for compression helical springs, Terms used in helical compression spring. Stresses in helical compression springs, Deflection of helical compression spring. Leaf springs- Applications, Length of leaf spring leaves. Standard Sizes of Automobile Suspension Springs.</p>	<p>using free and open-source software. Modelling work bench tools create a helical spring.</p> <p>using free and open-source software. part modelling work bench tools create a Leaf Spring.</p> <p>Simple problems on Helical springs.</p>
9	3		<p>Gears-Classification, terminology of gear. Law of gearing (Lewis Equation) Gear train, gear ratio, module of gear tooth, Centre distance between main</p>	<p>Create an 3D model of spur gear using any free and open-source software.</p> <p>Create an 3D model of a helical gear using any using free and open-</p>

		shaft and lay shaft,	source software. Simple problems.
10	4	Piston -Design consideration for a piston, Design of piston, piston pin & piston rings based on strength and heat transfer.	Create the part models of Piston, Piston Pin, Piston rings and assemble using free and open-source software. Simple problems on design of piston.
11	4	Connecting rod - Forces acting on connecting rod, Design concept of connecting rod.	Create the part models of connecting rod and assemble Simple problems on Connecting rod.
12	3	Cam and followers -types, Cam profile-types. Construct a cam profile using uniform velocity method and simple harmonic motion.	Create a 3D-part model of camshaft using free and open-source software. Simple Problems.
13	3	Design of clutch - Torque Transmitted through Single and Multi plates Clutches considering uniform wear condition.	Create a 3D-assembly model of single plate clutch assembly using any using free and open-source software. Simple problems.

4. References:

Sl. No	Title of Books	Author	Publications
1	A Text book of Machine Design	R.S. Khurmi & J.K. Gupta	S. Chand publication
2	Machine design	S G Kulkarni	McGraw Hill Education
3	Introduction to Machine design	V B Bhandari	McGraw Hill Education
4	Automotive Mechanics	Dr N K Giri	Khanna Publishers
5	Design Of Machine Elements Vol I, Vol II	J.B.K. Das, P.L. Srinivas Murthy	Sapna Publication
6	Auto Design	R B Gupta	Satya Prakashan
7	Design Data Hand Book for Mechanical Engineers	K Mahadevan & K Balveer Reddy	CBS publications

5. LIST SOFTWARES/WEBSITES

1. http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Machine%20design1/left_home.html
2. http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Machine%20design1/left_mod4.html
3. http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Machine%20design1/left_mod7.html.
4. http://nptel.ac.in/courses/Webcourse- contents/IIT%20Kharagpur/Machine%20design1/left_mod4.html
5. http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Machine%20design1/left_mod5.html
6. http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Machine%20design1/left_mod8.html

12. Rubrics for Portfolio evaluation

Level of Achievement

Assessment Parameter		Excellent (10)	Very Good (8)	Fair (6)	Poor (4)	Score
AP1	Organization of Report and Timely Submission	Lab report is well organized as directed and submitted on time	Lab report is well organized but not submitted on time	Report contains few errors and not submitted on time them	Poor organization and late submission	
AP2	Knowledge of Tools and Procedures	Demonstrates deep knowledge of tools and procedures; answer the related questions with explanations and elaboration	Adequate knowledge of most tools and procedures; answer the related questions, but fails to elaborate	Superficial knowledge of tools and procedures; able to answer only some of the related basic questions	Lack of information about most of the tools and procedures; cannot even answer basic related questions	
AP3	Team Working Skills	Positive in interacting with all group members, encourages such interaction in others, and always sensitive to the abilities and feelings of others' contributions; Actively helps to identify group goals and works effectively to meet them in assigned roles	Interacts with all group members spontaneously and contributes in a way that is sensitive to the abilities and feelings of others; Demonstrates commitment to group goals and carries out assigned roles effectively	Interacts with other group members if prompted, but sometimes expresses opinions which are insensitive to the abilities and feelings of others; Demonstrates commitment to group goals, but has difficulty performing assigned roles	Rarely interacts within a group, even with prompting, and shows frequent lack of sensitivity to others' feelings and abilities in opinions expressed; Shows little commitment to group goals and fails to perform assigned roles	
AP4	Result Analysis and Data Interpretation	Excellent insight and well-focused results and discussion; Data completely and appropriately interpreted and no over interpretation	Adequate insight but missed some important points in results and discussion; Interpreted most data correctly but some conclusions may be suspect or over-interpreted	Little insight and analysed only the most basic points; Interpreted some data correctly but significant errors, omissions still present.	No insight and entirely missed the point of the experiment; Little or no attempt to interpret data or over interpreted data.	
AP5	Task Management	Very Effective in managing the assigned task and allow experimenter(s) to achieve all goals	Somewhat effective in managing the assigned tasks and allow experimenter(s) to achieve most goals.	Somewhat ineffective in managing the assigned task and allow experimenter(s) to achieve only few goals.	Very ineffective and would not allow experimenters to achieve any goals	

6. CIE Assessment Methodologies

Sl. No	CIE Assessment	Test Week	Duration (minutes)	Max marks	Average of all CIE=50 Marks
1.	CIE-1TheoryTest	4	90	50	
2.	CIE-2Practice Test	7	180	50	
3	CIE-3TheoryTest	10	90	50	
4.	CIE-4Practice Test	13	180	50	
5	CIE-5 Portfolio evaluation of all the activities through Rubrics	1-13		50	
				Total	50 arks

7. SEE – Practice Assessment Methodologies

Sl. No	SEE – Practice Assessment	Duration (minutes)	Max marks	Min marks to pass
1.	Semester End Examination-Practice	180	50	20

8. CIE Theory Test model question paper

Program	Automobile engineering			Semester -IV	
Course Name	Machine design and drafting			Test	I/III
Course Code	25AT44I	Duration	90 min	Marks	50
Name of the Course Coordinator:					
Note: Answer any one full question from each section. Each full question carries equal marks.					
Q. No	Questions		Cognitive Level	Course Outcome	Marks
Section - 1					
1	a) Illustrate the stress-strain diagram for ductile materials. 10M		L2	1	25
	b) Explain the terms shear modulus and bulk modulus. 05M		L2	1	
	c) Illustrate the terms clearance fit, interference fit and transition fit. 10		L2	2	
2	a) Explain the terms linear strain, lateral strain, Poisson's ratio and volumetric strain. 10M		L2	1	
	b) Illustrate the terms shaft based and hole-based tolerance 10M		L2	2	
	c) Explain the terms center of gravity and moment of inertia 05M		L2	1	
Section - 2					
3	a) Find the center of gravity of given shape. 10M		L3	1	25
	b) An engine cylinder is 300 mm in diameter and the steam pressure is 0.7 N/mm ² . If the cylinder head is held by 12 studs, find the size. Assume safe tensile stress as 28 MPa. 10M		L3 L2	3	
	c) Explain the fasteners along with their applications. 05			3	
4	a) Find the area moment of inertia of given shape. 10M		L3	1	
	b) An eye bolt is to be used for lifting a load of 60 kN. Find the nominal diameter of the bolt, if the tensile stress is not to exceed 100 MPa. Assume coarse threads. 10M		L3	3	
	c) List different types of fasteners. 05M		L2	3	
Note for the Course coordinator: Each question may have one, two or three subdivisions. Optional questions in each section carry the same weightage of marks, cognitive level and course outcomes.					

Signature of the Course Coordinator

Signature of the HOD

Signature of the IQAC Chairman

9. CIE Practice Test model question paper

Program	Automobile engineering			Semester	
Course Name	Machine design and drafting			Test	II/IV
Course Code	25AT44I	Duration	180 min	Marks	50
Name of the Course Coordinator:					
Questions				CO	Marks
1) Conduct the experiment to draw the tensile stress-strain diagram for given ductile material.				1	50
2) Design a muff coupling under given load and material conditions and create the assembly model using any parametric modelling software.				3	
OR					
3) Conduct the experiment to draw the stress-strain diagram of the ductile material under compression.				1	
4) Design the unprotected flange coupling under given load and material conditions and create the assembly model using any parametric modelling software.				3	
Scheme of assessment for 1 and 3 experiments: Procedure-03M, conduction-10M, tabular column and results-05M, total 3+10+5=18M					18
Scheme of assessment for 2 and 4 experiments: Given data-2, Formulae-3, Calculation-5, part model-5, Assembly model-3, Total=18M					18
Common parameters: Viva-10M					10
Portfolio evaluation-04M					04
Total Marks					50

Signature of the Course Coordinator

Signature of the HOD

10. Suggestive Activities for Tutorials:

The List is an Example and not inclusive of all possible activities of the course. Students and Faculty are encouraged to choose activities that are relevant to the topic. Two activities, each for 50 marks should be evaluated with proper rubrics.

Sl.No.	Suggestive Activities for Tutorials
01	Collect stress-strain diagrams of different engineering materials, compare and prepare a report.
02	Collect various properties of different materials, compare and prepare a report.
03	Find the center of gravity and moment of inertia of different sections manually and using software.
04	Collect different types of fasteners, measure the dimensions and create solid models using parametric software.
05	Collect information on different types of solid modeling software and crate comparative analysis report.
06	Collect any one type of coupling, automotive component measures its dimension and create a solid model using any one of parametric software.

11. Rubrics for Assessment of Activity (Qualitative Assessment)

Sl. No.	Dimension	Beginner	Intermediate	Good	Advanced	Expert	Student sScore
		2	4	6	8	10	
1	Collection of data/ Material	Limited information	Collects basic information	Collects more information	Collects developed information	Collects a great deal of information	8
2	Quality of data	Irrelevant	Less relevant	Needs improvement	Satisfactor y	Very relevant	6
3	Quality of report	Not planned	Less organized	Moderately organized	Organized	As per the standards	4
4	Timely submission	Late submission	Submits after due date	Submits after reminders	Submit after a reminder	On time submission	2
5	Data references	No references.	Irrelevant references.	Given References not from authentic source.	Given references are from authenticat ed sources.	Enough authenticat ed references are given.	6
Example: Total= (8+6+4+2+6=26)							26/50

Note: Dimension and Descriptor shall be defined by the respective course coordinator as per the activities

12. SEE- Model Practice Question Paper

Program	Machine design and drafting		Semester	
Course Name	25AT44I	Course Code	Duration	180 min
Questions			CO	Marks
1. Conduct the experiment to draw the tensile stress-strain diagram for given ductile material. 2. Design a Piston, piston pin, piston rings under given working condition and material and create an assembly model of piston, piston pin and rings using any one of the parametric modeling software.			1	50
			4	
OR 1. Conduct the experiment to draw the stress-strain diagram of the ductile material under compression. 2. Design the connecting rod upper half and lower half under given load and material conditions and create the assembly model using any parametric modelling software.			1	50
			4	
Scheme of assessment for 1 and 3 experiments: Procedure-03M, conduction-10M, tabular column and results-05M, total 3+10+5=18M				18
Scheme of assessment for 2 and 4 experiments: Given data-2, Formulae-3, Calculation-5, part model-5, Assembly model-3, Total=18M				18
Common parameters: Viva-10M Portfolio evaluation-04M				10 04
Total Marks				50

2) Signature of the Examiner

2) Signature of the Examiner

13. Equipment/software list with Specification for a batch of 30 students

Sl.No.	Particulars	Specification	Quantity
01	Desktop Computer.	Latest generation intel i5 or AMD equivalent desktop with 16 GB ram, 512 GB SSD, 24-inch LED Display, with Nvidia or AMD Graphics card with Microsoft 11 OS. And Office 2024	10
02	Parametric Model Software	Solid works by Dassault systems	10 copies
02	Universal testing Machine	40 Ton Capacity with Standard Accessories	1
03	UPS	5KVA Sine wave UPS	1