GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering
Level: UG
Branch: Automobile Engineering
Subject Code: BE05002011
Subject Name: Automobile System I

w. e. f. Academic Year:	2024-25
Semester:	5
Category of the Course:	Professional Core Course

Prerequisite:	Basic knowledge of Engineering Mechanics, Thermodynamics and Manufacturing Processes.
Rationale:	This course provides fundamental knowledge of automobile systems including engine components, fuel systems, transmission systems and chassis. It helps students understand the construction, working and performance of various automobile subsystems and prepares them for advanced automobile engineering concepts.

Course Outcomes:

Sr. No.	CO statement	Marks% weightage
CO-1	Explain construction and working of I.C. engine systems	20
CO-2	Describe fuel supply and ignition systems	20
CO-3	Analyze transmission and power flow mechanisms	20
CO-4	Explain chassis, suspension and steering systems	20
CO-5	Identify braking systems and basic maintenance practices	20

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	PBL	Total no of hours per semester		ESE (E)	PA / CA (M)	PA/CA (I)	PBL (I)	ESE (V)	
45	00	30	15	90	03	70	30	20	30	50	200

Content:

Sr. No.	Content	Total Hrs
1	**Introduction:** Classification of automobiles, Layout of automobile (FR, FF, MR layouts), Major components of automobile, Types of engines, Engine terminology, Basic working of SI and CI engines	08

2	**Engine Systems:** Cylinder block, cylinder head, crankshaft, camshaft, piston assembly, valve mechanism, lubrication system, cooling system (air & water cooling), engine performance parameters	**10**
3	**Fuel Supply & Ignition Systems:** Carburetor, fuel injection system (MPFI, CRDI), fuel pump, air intake system, ignition systems (battery, magneto, electronic ignition), emission norms and control techniques	**8**
4	**Transmission System:** Clutch (types and working), gearbox (manual & automatic), propeller shaft, differential, final drive, transfer case, power flow in transmission system	**8**
5	**Chassis, Suspension & Steering:** Types of chassis, frame construction, suspension systems (leaf spring, coil spring, air suspension), steering geometry, power steering, wheel alignment	**6**
6	**Braking System & Maintenance:** Types of brakes (drum, disc, ABS), braking mechanism, brake fluids, basic automobile maintenance, troubleshooting common issues, safety practices	**5**
	Total	**45**

The syllabus Automobile System I contributes to

Unit	Topic	Relevant SDGs	Justification
1	Introduction to Automobile	SDG 9, 11, 13	Industrial development, sustainable transport, environmental impact
2	Engine Systems	SDG 7, 9, 13	Energy efficiency and emission reduction
3	Fuel Supply & Ignition	SDG 7, 12, 13	Efficient fuel usage and sustainability
4	Transmission System	SDG 9, 12	Energy efficiency and reduced losses
5	Chassis, Suspension & Steering	SDG 9, 11	Safe and sustainable transport
6	Braking & Maintenance	SDG 3, 11, 12	Road safety and maintenance

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**20**	**60**	**10**	**00**	**00**

R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Automobile Engineering – Kripal Singh
2. Automobile Engineering – R.B. Gupta
3. Automotive Mechanics – William H. Crouse

4. Fundamentals of Automobile Engineering – Venkanna & Swati

List of Experiments:

1. Study of I.C. engine components.
2. Study of valve timing diagram.
3. Study of lubrication system.
4. Study of cooling system.
5. Study of fuel supply system (carburettor/fuel injection).
6. Study of ignition system.
7. Study of clutch and gearbox.
8. Study of differential mechanism.
9. Study of suspension system.
10. Study of braking system.

List of Major Equipment:

1. **Cut section model of I.C. Engine**
2. **Clutch and Gearbox model**
3. **Differential model**
4. **Fuel Injection System setup**
5. **Brake system model**

List of suggested activities for Problem-based Learning (PBL):

Sr. No	PBL category	Name of the activity	No. of hours	Evaluation Criteria
1.	Complex Problem-Solving targeting relevant SDGs / Mini Project	Mini Project	15h (need to be changed as per total PBL hours)	Based on the novelty of project, technical understanding, report quality and presentation
2.	Case Study Analysis / Seminar	Seminar	15h (need to be changed as per total PBL hours)	Based on the quality of report and presentation, technical understanding
3.	Micro project	Micro project	8h (need to be changed as per total PBL hours)	Based on the novelty of project, technical understanding, quality of report and demonstration
4.	Industry/Research laboratory visit	Industry/Research laboratory visit	Visit = 5h, Report preparation = 5h Total = 10h	Based on report submitted. Report should contain observations and calculations based on industry/ lab data.

5.	Video Based Learning	Technical video-based learning related to the subject	Duration of video = 5h Report preparation = 5h Total = 10h	Report /presentation based on the video learning outcomes.
6.	Assignment / Technical Writing / Research Writing	Assignment writing. Numerical based assignment is preferable.	5 assignments of 4 h each Total = 20h	Based on the correctness of submitted assignment
7.	Group Discussion / Quiz / Simulation	Problem solving/Coding using C, C++, MATLAB, Python, SCILAB, modeling and Analysis software or any other software	5 small coding-based assignment of 2h each Total = 10h	Based on the coding solution submitted.
8.	Video Based Learning	Self-learning online course	Minimum duration of the course should be 10h	Examination based assessment at the end of course. Based on the certificate produced.
9.	Complex Problem-Solving targeting relevant SDGs / Mini Project	Identification and solution of Complex problem	Maximum 2 problems. Study of the problem and solution finding, Total = 10h	Based on the depth of the solution submitted.
10.	Video Based Learning	Videos on Industrial safety/Disaster Management aspects based on subject	Duration of video = 5h Report preparation = 5h Total = 10h	Based on quiz/report submitted
11.	Research Paper Review / Analysis	Technical paper reading and summarization of research papers based on relevant subject	5 research papers = 20h	Summarize research paper and evaluation critical parameters
12.	Poster / Chart / PowerPoint presentation	Poster/chart/power point preparation on technical topics	Duration = 6h	Based on poster/chart preparation and presentation skills
13.	Industry/Research laboratory visit	Industrial exposure for 2-3 days to observe and provide tentative solutions on society/environment/h	Duration = 15h for industrial exposure Problem identification and	Based on evaluation of critical problems and solutions

		ealth/sustainability/any other issue	tentative solution = 10h Total = 20h	
14.	Group Discussion / Quiz / Simulation	Group Discussion on emerging/trending technical topics based on subject	Duration = 1h – 3h per topic	Based on performance in group discussion, technical depth, knowledge etc.
15.	Case Study Analysis / Seminar	Real world case studies-based learning	Duration of data collection/study = 5h Report preparation = 5h Total = 10h	Based on in-depth study, technical depth, data collected, fact finding, etc.
16.	Group Discussion / Quiz / Simulation	Application/Software development	Duration = 10h	Depending on the complexity of the Application/Software
17.	Assignment / Technical Writing / Research Writing	Research paper publication	Duration = 10h	Based on submission of proof of publication
18.	Micro project	Upgradation/Reverse engineering studies of existing equipment of the laboratory	Duration 10h	Based on the performance of the equipment
19.	Industry/Research laboratory visit	Expert lecture/session	Duration 3h For attending the lecture/session– 2h and for report writing 1h	Based on the proof of attendance and report submitted
20.	Video Based Learning	Annotated Video Explanation of Concept/Problem	10h (Preparation + Recording + Submission)	Based on accuracy of explanation, clarity, and presentation style.
21.	Assignment / Technical Writing / Research Writing	Patent Search and Innovation Gap Identification	10h (Search + Report)	Based on number of relevant patents analyzed and identification of innovation scope.
22.	Assignment / Technical Writing / Research Writing	Preparation of a report on Indian Standard(s)	10h (study of Indian Standard(s) + report	Based on report quality and understanding of the relevant Indian Standard(s).

Note:

1. In alignment with Outcome-Based Education (OBE) and NBA accreditation requirements, the subject **Automobile System I compulsorily incorporates Micro Project and 5 marks as PBL activities for PEC and Seminar and Mini Project for PCC.**
   These activities are incorporated as integral Project-Based Learning (PBL) components. These activities are designed to foster experiential learning, encourage innovation, and strengthen problem-solving skills by engaging students in practical applications of power converter design, simulation, and analysis. The inclusion of PBL ensures that learners develop higher-order cognitive abilities mapped to Bloom's taxonomy, while simultaneously enhancing teamwork, communication, and research competencies essential for professional engineering practice.
2. The hours allocated to specific activities should be proportionate to the total no. of PBL hours and marks.
3. All the suggested activity should be related to the subject.
4. The number of hours is suggestive. Faculty can sub-divide the number of hours based on the activity. However, total number of hours is fixed.
5. Rubrics for the evaluation can be prepared by the faculty.
6. Subject teacher can add the relevant activities other than those listed above, with the consent of head of the department and DQAC.

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Sr. No.	Name of the activity	No. of hours	Evaluation Criteria
1.	Industry/Research laboratory visit	Visit = 5hrs., Report preparation = 5h Total = 10h	Based on report submitted. Report should contain observations and calculations based on industry/ lab data.
2.	Technical video-based learning related to the subject	Duration of video = 5h Report preparation = 5h Total = 10h	Report /presentation based on the video learning outcomes.
3.	Assignment writing. Numerical based assignment is preferable.	5 assignments of 4 h each Total = 20h	Based on the correctness of submitted assignment
4.	Problem solving/Coding using C, C++, MATLAB, Python, SCILAB, modeling and Analysis software or any other software	5 small coding-based assignment of 2h each Total = 10h	Based on the coding solution submitted.
5.	Self-learning online course	Minimum duration of the course should be 10h	Examination based assessment at the end of course. Based on the certificate produced.
6.	Identification and solution of Complex	Maximum 2 problems.	Based on the depth of the

	problem	Study of the problem and solution finding, Total = 10h	solution submitted.
7	Videos on Industrial safety/Disaster Management aspects based on subject	Duration of video = 5h Report preparation = 5h Total = 10h	Based on quiz/report submitted
8	Technical paper reading and summarization of research papers based on relevant subject	5 research papers = 20h	Summarize research paper and evaluation critical parameters
9.	Poster/chart/power point preparation on technical topics	Duration = 6h	Based on poster/chart preparation and presentation skills
10	Working/non-working model on technical topics	Working = 12h Non- working = 8h	Based on inter department/external evaluation
11	Industrial exposure for 2-3 days to observe and provide tentative solutions on society/environment/health/sustainability/any other issue	Duration = 15h for industrial exposure Problem identification and tentative solution = 10h Total = 20h	Based on evaluation of critical problems and solutions
12	Group Discussion on emerging/trending technical topics based on subject	Duration = Min. 1h per topic, max. 3h. per topic	Based on performance in group discussion, technical depth, knowledge etc.
13.	Real world case studies-based learning	Duration of data collection/study = 5h Report preparation = 5h Total = 10h	Based on in-depth study, technical depth, data collected, fact finding, etc.
14.	Application/Software development	Duration = 10h	Depending on the complexity of the Application/Software
15.	Research paper publication	Duration = 10h	Based on submission of proof of publication
16.	Upgradation/Reverse engineering studies of existing equipment of the laboratory	Duration 10h	Based on the performance of the equipment
17.	Expert lecture/session	Duration 3h For attending the lecture/session– 2h and for report writing 1h	Based on the proof of attendance and report submitted
18.	Annotated Video Explanation of Concept/Problem	10h (Preparation + Recording + Submission)	Based on accuracy of explanation, clarity, and presentation style.

19.	Patent Search and Innovation Gap Identification	10h (Search + Report)	Based on number of relevant patents analyzed and identification of innovation scope.
20.	Preparation of a report on Indian Standard(s)	10h (study of Indian Standard(s) + report	Based on report quality and understanding of the relevant Indian Standard(s).

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