

Department Name : Automobile Engineering

UG Program Name : B. Tech. Automotive Technology

Vision and Mission :

Vision :

- To offer programs of global repute with an emphasis on academics, research and innovation to provide competent and efficient human resources in the field of automotive engineering to fulfill the needs of the society.

Mission:

- To design and enrich the curricula based on changing needs of industry and society.
- To develop a center of excellence to promote automotive research and attract industry assignments.
- To provide an excellent academic environment for development of competent automotive professionals to meet industry expectations.
- To ensure participation of every stakeholder to enhance effectiveness of the programs being offered

Sr. No.	Program Outcomes
PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2	Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
PO3	Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems
PO5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
PO6	The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO12	Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change

Sr. No.	Program Specific Outcomes
PSO1	Diagnose the automotive system failures and repair / replace the components / systems so as to bring the vehicle in original condition.
PSO2	Perform the role of motor claim approver and loss assessor with confidence and competence.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
1.	III	SH2032	Engineering Mathematics-III	<ol style="list-style-type: none"> 1. Solve mechanical engineering problems using Linear Differential Equations. 2. Apply Partial Differential Equations to various engineering problems. 3. Solve Engineering problems using Laplace Transform. 4. Apply knowledge of vector differentiation to find directional derivatives, curl, and divergence of vector fields. 5. Evaluate Fourier transforms and apply them to solve heat conduction problems in engineering.
2.	III	AT201	Applied Thermodynamics	<ol style="list-style-type: none"> 1. Interpret energy interaction. 2. Apply laws of thermodynamics to engineering systems. 3. Apply entropy increase principle for thermodynamic processes. 4. Examine phase change of pure substance. 5. Analyze the performance of thermodynamic cycles.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
3.	III	AT203	Engineering Mechanics	<ol style="list-style-type: none"> 1. Classify various forces and their effects to analyses real life problems. 2. Analyze engineering problems applying conditions of equilibrium 3. Apply fundamental concepts of kinematics and kinetics to the analysis of practical problems. 4. Determine centroid & moment of inertia of the geometrical plane lamina.
4.	III	AT205	Fluid Mechanics and Machinery	<ol style="list-style-type: none"> 1. Compare various properties of fluids at rest and in transit 2. Analyze fluid systems using equations such as Bernoulli's equation and Continuity equation 3. Examine energy losses in pipes to enable drawing energy gradient lines 4. Solve viscous and boundary layer flow problems 5. Evaluate the performance characteristics of hydraulic turbines 6. Evaluate the performance characteristics of hydraulic pumps
5.	III	AT207	Automotive Systems	<ol style="list-style-type: none"> 1. Explain constructional details and operation of the automotive systems. 2. Interpret the influence of various technical parameters on the behavior of the automotive systems. 3. Configure the systems and its elements for integrating into drivetrain/chassis systems appropriate for given automotive application. 4. Present the advanced versions of automotive systems.
6.	III	SH2173	Environmental Science	<ol style="list-style-type: none"> 1. Discuss the importance and sensitivity of environment. 2. Interpret the over exploitation of natural resources and follow the environmental ethics. 3. Explain methods to protect environment and prevent environmental pollution. 4. Apply their knowledge and skills to solve environment related problems

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
7.	III	AT211	Engineering Mechanics Lab.	<ol style="list-style-type: none"> 1. Verify law of polygon of forces, law of triangle of forces and principle of moment. 2. Compare coefficient of friction of various surfaces in contact. 3. Correlate theoretical and practical results of support reactions and Centroid of plane lamina. 4. Analyze a simple truss
8.	III	AT213	C++ Programming Lab.	<ol style="list-style-type: none"> 1. Identify elements and features of object-oriented Programming. 2. Implement various object-oriented concepts with the help of programs. 3. Apply the object-oriented concepts in real time problem solving. 4. Use constructors and destructors in programming. 5. Implement inheritance concept in programming.
9.	IV	AT215	Automotive Systems Lab.	<ol style="list-style-type: none"> 1. Identify and list elements of various transmission and chassis systems. 2. Draw sketches /schematics of transmission and chassis systems. 3. Describe the operating principles, functions, constructional details and working of these systems. 4. Compare various configurations/subtypes of these systems.
10.	IV	AT217	Machine Drawing Lab.	<ol style="list-style-type: none"> 1. Represent mechanical elements and materials with their conventions. 2. Draw free-hand sketches of machine components in proportion. 3. Draw part and assembly drawing for given machine elements. 4. Prepare production drawing as per given requirements. 5. Draw interpenetration of solids as per given requirements
11.	IV	AT219	Technical Aptitude-I	<ol style="list-style-type: none"> 1. Comprehend the knowledge gained in the course work 2. Demonstrate problem-solving ability
12.	IV	SH2633	Professional Leadership Skills	<ol style="list-style-type: none"> 1. Explain the traits of a leadership through real life examples.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 2. Exhibit the ability to work effectively in team. 3. Prepare a presentation as per the audience and context requirements.
13.	IV	SH2613	Interpersonal Skills ('Jeevanvidya' for Work Life Balance)	<ol style="list-style-type: none"> 1. Exhibit interpersonal communication skills. 2. Demonstrate decision-making skills. 3. Apply conflict resolution styles appropriate in different situations. 4. Demonstrate skills to manage balance in work and life. 5. Apply Jeevanvidya wisdom in day to day life.
14.	IV	SH2693	Innovation Tools and Methods for Entrepreneurs	<ol style="list-style-type: none"> 1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them 2. Apply User Journey Map to the selected problem to show user interaction at various stages 3. Analyze the solutions provided by competitors for effectiveness and gaps if any.
15.	IV	SH2593	Personal Effectiveness and Body Language	<ol style="list-style-type: none"> 1. Develop skills to build self-esteem and positive attitude. 2. Develop interpersonal skills characterized by effective communication and conflict resolution. 3. Discover ways to overcome procrastination. 4. Demonstrate responsiveness towards stress and health issues. 5. Interpret the non-verbal behaviour of a person.
16.	IV	SH2733	German Language - Basic Level	<ol style="list-style-type: none"> 1. Interpret the language if the next person is speaking slowly and clearly. 2. Make use of the language in routine life with the routing topics like family, shopping, work etc. 3. Demonstrate the language by self-introduction in German with simple sentences.
17.	IV	SH2713	Japanese Language - Level III	<ol style="list-style-type: none"> 1. Make use of basic conversations in various situations. 2. Identify the sentence patterns.

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				<ul style="list-style-type: none"> 3. Explain insights about the communication required for living in Japan. 4. Interpret Japanese work ethics required in their professional career.
18.	IV	AT202	Automotive Materials & Manufacturing Technology	<ul style="list-style-type: none"> 1. Describe various engineering alloys, non-metallic & modern materials 2. Select suitable material for particular automotive application. 3. Describe casting, machining & forming processes for automotive applications. 4. Explain various gear manufacturing processes.
19.	IV	AT204	Mechanics of Materials	<ul style="list-style-type: none"> 1. Apply elementary knowledge of stresses and strains 2. Select appropriate beam section for mechanical applications 3. Apply stiffness criteria for beam analysis 4. Analyze the circular shaft subjected to pure torsion 5. Apply energy method for structural analysis of solid body
20.	IV	AT206	Electric Drives	<ul style="list-style-type: none"> 1. Discuss the concepts in power electronics converters required for electrical drives. 2. Explain the fundamental concepts, block diagram and advantages of electrical drives. 3. Describe the working and characteristics of DC and AC drives 4. Analyze DC and AC drives to determine performance parameters 5. Apply the knowledge of electrical drives for applications in automotive engineering. 6. Select the special motors for advanced applications
21.	IV	AT208	Heat Transfer	<ul style="list-style-type: none"> 1. Compute temperature distribution using steady-state and unsteady-state heat conduction 2. Analyze heat transfer through extended surfaces

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				3. Analyze forced and free convection heat transfer situations. 4. Apply the principles of radiation heat transfer to engineering problems 5. Design heat exchangers using LMTD and NTU methods
22.	IV	AT210	Automotive Electronics & Embedded Systems	1. Choose the right microcontroller/processor for various automotive applications. 2. Select sensors and actuators for typical automotive applications. 3. Illustrate the safety systems in automobiles and diagnostics systems. 4. Comprehend automotive embedded systems and its future trends. 5. Describe automotive hardware and software systems.
23.	IV	AT212	Solid Modelling Lab.	1. Develop 3D model of automotive components. 2. Assemble components using functional constraints. 3. Prepare production drawings in drafting workbench. 4. Develop surface models in modeling software. 5. Design Sheet Metal component and mold for plastics. 6.
24.	IV	AT214	Thermal Engg. & Fluid Mechanics Lab.	1. Verify and apply Bernoulli's theorem 2. Calculate various losses through pipes 3. Evaluate various efficiencies of pump and compressor 4. Apply basic laws of heat transfer in conduction, convection and radiation domain 5. Compute effectiveness of heat exchanger 6. Evaluate COP of refrigeration and air conditioning system
25.	IV	AT216	Automotive Electrical and Electronics Lab.	1. Identify various elements of automotive electrical and electronics systems

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				<ol style="list-style-type: none"> Describe the operation of automotive electrical and electronics systems along with the role of elements. Test various systems/elements to assess their performance or condition.
26.	IV	AT218	Python Programming	<ol style="list-style-type: none"> To acquire programming skills in core Python. Implement program using loops, decision statements and functions in Python To acquire Object Oriented Skills in Python Use methods in writing python programming. Implement file handling and database handling using python. Plot data using appropriate Python visualization libraries.
27.	IV	AT220	Technical Aptitude-II	<ol style="list-style-type: none"> Comprehend the knowledge gained in the course work Demonstrate problem-solving ability
28.	IV	SH2643	German Language - Advanced Level	<ol style="list-style-type: none"> Interpret the language if the next person is speaking slowly and clearly. Make use of the language in routine life with the routing topics like family, shopping, work etc. Demonstrate the language by self-introduction in German with simple sentences.
29.	IV	SH2623	Japanese Language - Level IV	<ol style="list-style-type: none"> To be able to make basic conversations in various situations. To recognize the sentence patterns. To improve Japanese Language proficiency. To give students insights about the communication required for living in Japan. To expose students to the Japanese work ethics required in their professional careers.
30.	V	MA301	Internal Combustion Engines	<ol style="list-style-type: none"> Perform a primary thermodynamic analysis of Otto and diesel cycle engines.

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				<ol style="list-style-type: none"> 2. Select appropriate engine for specific application. 3. Select proper fuel system for IC engine. 4. Conduct performance test of IC engine and portray operating characteristics of engine. 5. Identify abnormal combustion in engine and remedy over it. 6. Select proper lubrication, intake, exhaust, cooling system for engine.
31.	V	MA303	Dynamics of Machines	<ol style="list-style-type: none"> 1. Analyze kinematic parameters of gears in mesh for typical power transmission application. 2. Explain the effect of gyroscopic effect on naval ship, aero plane etc. 3. Determine dynamic forces and torques acting on reciprocating engine mechanism. 4. Analyze rotating and reciprocating components of machines to compute the magnitude and direction of balancing mass. 5. Formulate mathematical models of systems and determine the natural frequency of undamped and damped free vibrations of single degree freedom systems. 6. Determine the response of vibrating systems under forced harmonic excitations
32.	V	MA305	Heat Transfer	<ol style="list-style-type: none"> 1. Compute temperature distribution using steady-state and unsteady-state heat conduction 2. Analyze heat transfer through extended surfaces. 3. Analyze forced and free convection heat transfer situations. 4. Apply the principles of radiation heat transfer to engineering problems. 5. Design heat exchangers using LMTD and NTU methods.
33.	V	MA307	Automotive Systems	<ol style="list-style-type: none"> 1. Explain constructional details and operation of the automotive systems.

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				<ol style="list-style-type: none"> 2. Interpret the influence of various technical parameters on the behavior of the automotive systems. 3. Configure the systems and its elements for integrating into drivetrain/chassis systems appropriate for given automotive application. 4. Present in detail the technological advancements of the automotive systems.
34.	V	MA309	Autotronics	<ol style="list-style-type: none"> 1. Demonstrate the use of electronics in automotive system 2. Illustrate engine management system and justify the use of electronics in it 3. Describe various sensors and actuators required for automobiles 4. Illustrate the applications of advanced automotive technologies embedded with electronics 5. Explain the technologies used for alternately propelled vehicles.
35.	V	MA311	Product Design and Development	<ol style="list-style-type: none"> 1. Describe the product development process in general. 2. Plan the proposed product and establish its specifications. 3. Generate, screen and test concepts for proposed product. 4. Apply various techniques like industrial design, DFX for developing a product. 5. Perform economic analysis of proposed product.
36.	V	MA313	Tribology	<ol style="list-style-type: none"> 1. Describe the theories of friction and wear mechanisms. 2. Apply principle of hydrodynamic lubrication for designing bearing. 3. Analyse and optimize the hydrostatic bearing for minimum energy loss. 4. Apply Reynolds equation for designing gas lubrication system. 5. Select appropriate surface treatment for minimum wear and high corrosion resistance.

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37.	V	MA315	Fuels and Combustion	<ol style="list-style-type: none"> 1. Write the properties and measurement techniques of various types of fuels. 2. Describe the processing and handling of various types of fuels 3. Describe various parameters that are utilized to characterize fuels and its combustion process. 4. Identify the utilization of combustion devices for appropriate application.
38.	V	MA317	Welding and Joining Technology	<ol style="list-style-type: none"> 1. Describe various joining processes, their significance & applications 2. Select appropriate welding process for particular joining operation 3. Compare different welding processes to analyse suitability of a particular welding process for variety of applications. 4. Select appropriate Non-Traditional Machining Processes for particular application
39.	V	MA319	Transport Management	<ol style="list-style-type: none"> 1. Describe the motor vehicle act & central motor vehicle rules. 2. Illustrate motor vehicle insurance & taxation. 3. Analyze the passenger & goods transport operations. 4. Identify advanced techniques in traffic management
40.	V	MA321	Industrial Engineering	<ol style="list-style-type: none"> 1. Apply industrial engineering tools to improve productivity 2. Decide plant lay out and suitable material handling system. 3. Examine work measurement and inventory control techniques. 4. Plan production activities using tools like PPC, Capacity and Aggregate planning
41.	V	MA323	I. C. Engine Lab.	<ol style="list-style-type: none"> 1. Demonstrate the fuels supply, lubrication, cooling systems. 2. Conduct the test on single cylinder and multi-cylinder petrol & diesel engines 3. Plot the engine performance characteristics curves and interpret the curves.

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				<ol style="list-style-type: none"> 4. Calculate B.P., I.P., F.P., air/fuel ratios, and various engine efficiencies. 5. Conduct the test and prepare heat balance sheet.
42.	V	MA325	Thermal Engineering Lab	<ol style="list-style-type: none"> 1. Apply laws of heat transfer in conduction, convection and radiation domain. 2. Compute effectiveness of heat exchangers. 3. Determine effectiveness of pin fin. 4. Evaluate COP of Refrigeration and air conditioning system.
43.	V	MA327	Automobile Engineering Lab.	<ol style="list-style-type: none"> 1. Describe the operating principle, functions, and constructional details of suspension, steering, braking & transmission systems used in automobiles. 2. Apply the concepts of human ergonomics for design of automobile. 3. Explain the use of various tests for designing the vehicle body. 4. Test the working of various electrical components using testing instruments.
44.	V	MA329	Theory of Machines Laboratory	<ol style="list-style-type: none"> 1. Design a gear tooth profile for given engineering application. 2. Determine Gyroscopic couple and verify Gyroscopic law. 3. Plot polar diagram based on the experimental readings on Hook's joint. 4. Design a cam profile for given application. 5. Plot characteristic curves for centrifugal governors 6. Determine moment of inertia of rigid bodies. 7. Apply balancing methods to balance rotating and reciprocating masses. 8. Analyze vibration characteristics of single degree of freedom systems. 9. Determine critical speed of shafts.
45.	V	MA331	Comprehensive Exam.-III	<ol style="list-style-type: none"> 1. Comprehend the knowledge gained in the course work. 2. Demonstrate problem-solving ability

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
46.	V	SH3032	Aptitude Training-I	<ol style="list-style-type: none"> 1. Develop a thorough conceptual understanding and develop a logical approach towards solving Aptitude and Reasoning problems. 2. Understand usage of basic aptitude terms of percentages, averages, ratios, and applications of business aptitude terms of profits and interests 3. Develop a bridge in analogies, series, and visualizing directions. 4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams.
47.	V	MA333	Summer Internship	<ol style="list-style-type: none"> 1. Acquaint with garage environment and processes to be carried out. 2. Handle various tools and equipments used in garages. 3. Diagnose minor faults of vehicle. 4. Summarize the uses of advanced tools and equipments. 5. Communicate and present his ideas/work in front of peers and superiors.
48.	V	SH3012	Indian Constitution	<ol style="list-style-type: none"> 1. Create awareness about law depiction and importance of Constitution 2. Define Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life, and their social Responsibilities. 3. Create Awareness of their Surroundings, Society, Social problems, and their suitable solutions while keeping rights and duties of the citizen keeping in mind. 4. Recognize distribution of powers and functions of Local Self Government. 5. Comprehend the National Emergency, Financial Emergency, and their impact on Economy of the country.
49.	VI	MA302	Design of Machine Elements	<ol style="list-style-type: none"> 1. Discuss steps of design and theories of elastic failure.

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				<ol style="list-style-type: none"> 2. Design joints for different loading conditions. 3. Design shafts keys and couplings to transmit required amount of torque and power. 4. Design four types of gears namely spur, helical, bevel and worm by using different considerations. 5. Design components like spring and levers.
50.	VI	MA304	Electric and Hybrid Electric Vehicles	<ol style="list-style-type: none"> 1. Articulate the need of EVs and HEVs in today's transportation context. 2. Design an electric vehicle for given requirements. 3. Design a hybrid electric vehicle for given requirements. 4. Elaborate fuel cell technology for vehicular application.
51.	VI	MA306	Automotive Safety & Ergonomics	<ol style="list-style-type: none"> 1. Discuss the basics of vehicle collision and its effects. 2. Summarize the various safety concepts used in passenger cars. 3. Explain use of ergonomics in automotive design. 4. Explain the human response to impact. 5. Explain the use of various systems used in automobiles for safety & ergonomic considerations.
52.	VI	MA308	Automotive Emission and Control Technologies	<ol style="list-style-type: none"> 1. Outline the overview of emission control technologies in SI engine. 2. Explore effect of engine design parameters and engine operating variables on SI engines. 3. Analyse the pollutant formation mechanisms in IC engine emissions. 4. Illustrate the knowledge of emission norms, standard test procedures and emission measurements techniques. 5. Analyse different emission control technologies in IC engines.
53.	VI	MA310	Sensors and Actuators	<ol style="list-style-type: none"> 1. Illustrate the construction and working of various automotive sensors and actuators.

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				<ol style="list-style-type: none"> 2. Select suitable sensor for automotive applications. 3. Select suitable actuator for automotive applications. 4. Describe the diagnostics tools and equipments used for testing of electronic components, sensors and actuators.
54.	VI	MA312	Advanced Manufacturing Processes	<ol style="list-style-type: none"> 1. Select suitable surface treatment processes for particular application. 2. Select appropriate advanced machining process for particular application. 3. Use various composite materials & ceramics in component manufacturing. 4. Compare traditional & advanced manufacturing processes
55.	VI	MA314	Advanced Materials	<ol style="list-style-type: none"> 1. Identify material demanding for extreme conditions 2. Make use of Smart, magnetic & nano-materials 3. Acquire knowledge of composite materials and polymers. 4. Suggest suitable material for particular application.
56.	VI	MA316	Total Quality Management	<ol style="list-style-type: none"> 1. Apply principles and techniques of TQM to improve quality 2. Plan and control the quality 3. Test the reliability of product and system 4. Apply TQM techniques in service sector
57.	VI	MA318	Supply Chain Management	<ol style="list-style-type: none"> 1. State the scope and practice of business logistics and supply chain management. 2. Explain the use of planning networks to manage flows. 3. Explain the use of inventory and warehousing for effective supply chain management. 4. Analyze the importance of transportation & packaging in supply chain management.

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				5. Explain the use of organizational structure of a company to control the effectively manage the supply chain.
58.	VI	OE3023	Reliability Engineering	<ol style="list-style-type: none"> 1. Demonstrate an awareness about the concepts of Reliability, Availability and Maintainability. 2. Build system reliability models for different configurations. 3. Evaluate the reliability of simple and complex systems 4. Apply the appropriate methodologies to determine time and strength based reliabilities. 5. Implement strategies for improving reliability of repairable and non-repairable systems
59.	VI	OE3043	Renewable Energy Sources	<ol style="list-style-type: none"> 1. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, concerning future supply and the environment 2. Describe the primary renewable energy resources and technologies. 3. Apply the knowledge of thermodynamic and heat transfer principles to evaluate the performance of energy conversion systems for maximum efficiency. 4. Compare the various renewable energy technologies.
60.	VI	SH302	Biology for Engineers	<ol style="list-style-type: none"> 1. Apply biological engineering principles, procedures needed to solve real-world problems 2. Demonstrate the functions of biological systems 3. Analyze biological phenomena with math and physics to gain important insights 4. Explain working of different biomedical instruments 5. Select the sensors for given biological applications 6. Explain relevant aspects of movement control process.

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61.	VI	MA320	Automotive Diagnostic Lab.	<ol style="list-style-type: none"> 1. Carry out engine tune-up. 2. Illustrate the critical inspection parameters while engine top overhaul. 3. Measure wear of engine components. 4. Perform wheel balancing and wheel alignment. 5. Test spark plug and fuel injector performance as per their specification. 6. Overhaul clutch, gearbox, braking system, electrical system, differential and axles.
62.	VI	MA322	Advance Modeling Lab	<ol style="list-style-type: none"> 1. Develop surface models in modeling software. 2. Design sheet metal components. 3. Simulate the working of systems. 4. Design mold for plastic component manufacturing
63.	VI	MA324	Comprehensive Exam-IV	<ol style="list-style-type: none"> 1. Comprehend the knowledge gained in the course work. 2. Demonstrate problem-solving ability.
64.	VI	MA326	Capstone Project Phase -I	<ol style="list-style-type: none"> 1. Carry out literature survey and identify as well as select a problem. 2. Comprehend and analyze an engineering problem and report findings to provide an appropriate solution. 3. Design an experimental setup or develop an analytical model to analyze the system under consideration. 4. Communicate problem, methodology and outcomes systematically and effectively in the form of a technical report. 5. Work as a member and a team leader in engineering teams / multidisciplinary teams. 6. Demonstrate an ability to use different tools and techniques to solve the given problem. 7. Demonstrate ethical behavior while completing the project work within given constraints and while delivering the expected outcomes.

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65.	VI	SH3052	Aptitude Training-II	<ol style="list-style-type: none"> 1. Develop a thorough conceptual understanding and develop a logical approach towards solving Aptitude and Reasoning Problems 2. Understand usage of aptitude terms of speed, time and distance and permutations, probabilities, and applications. 3. Understand blood relations and ways of seating arrangements along with various geometrical figures 4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams.
66.	VII	MA401	Automotive System Design	<ol style="list-style-type: none"> 1. Design automotive clutch system for given automotive applications. 2. Design gearbox for automotive application. 3. Design leaf spring and coil spring for automotive suspension. 4. Design braking system (Internal expanding shoe type) for a vehicle. 5. Design front axle, differential, propeller shaft & final drive for automotive application.
67.	VII	MA403	Vehicle Dynamics	<ol style="list-style-type: none"> 1. Evaluate vehicle acceleration performance & stability of vehicle over the range of operating conditions. 2. Determine braking performance of a vehicle when provided with specifications. 3. Evaluate the response of tires for various operating conditions. 4. Evaluate handling characteristics of a vehicle for a given set of data. 5. Apply ride concepts while designing a suspension system for a vehicle.
68.	VII	MA405	Finite Element Analysis	<ol style="list-style-type: none"> 1. Discretize the physical domain using appropriate elements 2. Check the finite element model. 3. Develop FEA codes for analysis of structural problems. 4. Analyze thermal problems using FEA.

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				5. Use isoparametric formulation for irregular geometries.
69.	VII	MA407	Design of Composite Materials	<ol style="list-style-type: none"> 1. Choose an appropriate constituent materials for composite manufacturing. 2. Select suitable fabrication technique to produce composite parts. 3. Analyse elastic behaviour of composite lamina using different approaches. 4. Describe the failure mechanism in the composite lamina. 5. Analyse the progressive failure in the composite laminate.
70.	VII	MA409	Tool Engineering	<ol style="list-style-type: none"> 1. Evaluate machining time for various machining processes. 2. Evaluate cutting forces and their effects on chip formation 3. Calculate temperature in primary and secondary deformation zones. 4. Design single point cutting tool for particular application
71.	VII	MA411	Rapid Prototyping	<ol style="list-style-type: none"> 1. Apply and use techniques for processing of CAD models for rapid prototyping. 2. Apply fundamentals of rapid prototyping techniques. 3. Select appropriate tooling for rapid prototyping process. 4. Design rapid prototyping techniques for reverse engineering.
72.	VII	MA413	Quantitative Techniques	<ol style="list-style-type: none"> 1. Apply linear programming models to solve transportation and assignment problems. 2. Solve the problems of inventory control by optimizing order quantity and inventory cost. 3. Plan, Schedule and Control project activities by adhering to time and financial constraints. 4. Determine the optimum sequence of operations to minimize time and cost. 5. Determine optimum queue length and waiting time using waiting line models.
73.	VII	MA415	Engineering Economics	<ol style="list-style-type: none"> 1. Account for the time value of money in economic analyses.

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				<ol style="list-style-type: none"> 2. Identify market demand and supply scenario. 3. Calculate rates of return on investments. 4. Analyze cash flow. 5. Determine economic life of an asset. 6. Apply different methods of depreciation.
74.	VII	MA417	Hydraulics and Pneumatics	<ol style="list-style-type: none"> 1. Describe the fundamentals of hydraulics and pneumatics. 2. Explain different components of fluid power system. 3. Design hydraulic and pneumatic circuits for specific applications.
75.	VII	MA419	Engine Design	<ol style="list-style-type: none"> 1. Apply fluctuating stress theories for real life problems 2. Select proper type of engine for given requirement. 3. Design engine components like cylinder, cylinder block, piston, connecting rod, crank shaft etc. 4. Design valve, gear train, cooling and lubrication systems. 5. Select proper type of bearings.
76.	VII	MA421	Refrigeration and Air Conditioning	<ol style="list-style-type: none"> 1. Illustrate the basic concepts of refrigeration and air conditioning systems. 2. Identify desirable properties of refrigerants. 3. Analyze the performance of refrigeration cycles. 4. Plot various refrigeration and Air conditioning processes using various charts and property tables. 5. Apply engineering principles to design refrigeration and air conditioning systems for various applications.
77.	VII	MA423	Robotics and Automation	<ol style="list-style-type: none"> 1. Explain robot anatomy and functions. 2. Develop basic robot programs. 3. Perform robot economic analysis. 4. Explain need and basic elements of industrial automation. 5. Perform quantitative analysis of transfer lines and Assembly lines.

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78.	VII	MA425	Automotive Business Management	<ol style="list-style-type: none"> 1. Start a venture, monitor and evaluate it for avoiding sickness, how to revive sick units and effectively manage small business 2. Prepare automotive dealership layout and its requirements. 3. Apply concepts of management in parts ordering and servicing. 4. Illustrate management tools for showroom and service sector automobile industry.
79.	VII	MA427	Motor Vehicle Insurance Practices	<ol style="list-style-type: none"> 1. Discuss applications of insurance principles in vehicle insurance. 2. Describe various forms in motor vehicle insurance. 3. Discuss MACT in detail. 4. Analyze fraud management and internal audit in relation with motor vehicle insurance
80.	VII	MA429	Product Life Cycle Management	<ol style="list-style-type: none"> 1. Explain the concept & need of PLM. 2. Apply PLM strategy in an industry. 3. Explain the product development process in an industry. 4. Analyze the product structure modeling & product data management. 5. Explain the recent advances in PLM.
81.	VII	MA431	Computational Fluid Dynamics	<ol style="list-style-type: none"> 1. Describe the physical significance of the governing equations for fluid dynamics and heat transfer. 2. Develop finite difference implicit & explicit algorithms for fluid flow and heat transfer problems. 3. Analyze the errors & stability in CFD discretization schemes. 4. Select appropriate grid generation methods for CFD analysis. 5. Apply different CFD Techniques to various fluid flow problems.
82.	VII	MA433	Automotive Aerodynamics	<ol style="list-style-type: none"> 1. Apply basic principles of aerodynamics for the design of vehicle body. 2. Calculating lift and drag of automotive models

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 3. Describe the physics of fluid flow over vehicle body and its optimization techniques. 4. Use of wind tunnels in testing the vehicles. 5. Apply computational fluid dynamics (CFD) tool for aerodynamics study.
83.	VII	MA435	Fuel Cell Technology	<ol style="list-style-type: none"> 1. Apply the fundamentals of thermodynamics and electrochemistry for fuel cell system analysis. 2. Describe various fuel cell technologies relevant for motor vehicle application. 3. Choose appropriate hydrogen production and storage technology for given application. 4. Configure and analyse the fuel cell powertrain for given application.
84.	VII	MA437	Production and Operation Management	<ol style="list-style-type: none"> 1. List an overall view of the decision-making process as it relates to the major areas of Production/Operations Management. 2. Explain production planning as a pre-production activity that involves arranging and designing the production system, with the use of effective techniques. 3. Develop the concept of product planning and quality control measures to maximize both customer satisfaction and company profits. 4. Identify the evolution of principles that makes it possible to design facilities, processes, and control systems with a degree of predictability in their performance. 5. Make use of the programmes that help optimize inventory control, which is critical in achieving business success and to develop a degree of competency in controlling the operations systems.
85.	VII	MA439	Project Management	<ol style="list-style-type: none"> 1. Play role of a project manager successfully. 2. Plan and control projects.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ul style="list-style-type: none"> 3. Manage project time and cost. 4. Manage quality during entire project duration. 5. Make decision related to procurement 6. Undertake risk management
86.	VII	MA441	Vehicle Performance Evaluation & Emission Testing Laboratory	<ul style="list-style-type: none"> 1. Analyse performance of two and four wheelers using on road and laboratory testing methods. 2. Determine noise level in automotive systems using noise measurement systems. 3. Use vibration measurement system to determine vibration characteristics of automotive systems and components. 4. Analyse emission characteristics of petrol and diesel engines. 5. Select appropriate sensor for performance evaluation of vehicle and vehicle components.
87.	VII	MA443	CAE Software Proficiency	<ul style="list-style-type: none"> 1. Formulate the automotive engineering problems for simulating its functional design. 2. Simulate real life problems using modern software tools, 3. Interpret the simulation results for modification in design. 4. Optimize engineering problems using software tools. 5. Present the technical and non-technical issues encountered during completion of simulation project.
88.	VII	MA445	Hydraulics and Pneumatics Laboratory	<ul style="list-style-type: none"> 1. Identify and draw fluid power symbols. 2. Select proper components to build fluid power circuit. 3. Develop required circuits using selected components.
89.	VII	MA447	Engine Design Laboratory	<ul style="list-style-type: none"> 1. Design the components and system of engine. 2. Develop the CAD model of engine components
90.	VII	MA449	Refrigeration and Air Conditioning Lab	<ul style="list-style-type: none"> 1. Identify various components and controls of refrigeration and air conditioning systems.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 2. Plot the refrigeration cycles on p-h chart and psychrometric processes on psychrometric chart. 3. Calculate theoretical, actual and relative COP of various systems using psychrometric calculations. 4. Select appropriate method of refrigeration for the given application.
91.	VII	MA451	Robotics and Automation Lab	<ol style="list-style-type: none"> 1. Demonstrate/select proper types of sensors/transducers for given task. 2. Design signal conditioning circuits for various signal conditioning processes like signal level change, signal form change, filters, bridge circuits etc. 3. Demonstrate ability of control and automation of simple devices such as motors, cylinders using PLC. 4. Demonstrate the ability to create microcontroller programs and properly interface them to input and output devices.
92.	VII	MA453	Automotive Business Management Lab	<ol style="list-style-type: none"> 1. Comprehend the detailing of various records to be used in service sector (Dealership). 2. Carry out motor accident survey. 3. Prepare report for spare part analysis. 4. Design a layout for Automotive Dealership
93.	VII	MA455	Motor Vehicle Insurance Practices Lab	<ol style="list-style-type: none"> 1. Comprehend the detailing of various forms to be used in insurance sector. 2. Carry out motor accident survey. 3. Prepare accident survey report. 4. Settle the claim of motor accident insurance.
94.	VII	MA457	Capstone Project Phase-II	<ol style="list-style-type: none"> 1. Demonstrate the ability to develop creative and original solutions to engineering problems of significant complexity. 2. Work as an individual member of a team, with support from a supervisor, formulating solutions to day-to-day problems by integrating knowledge and experience gained during the course and beyond that.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 3. Demonstrate the ability to produce a formal engineering report. 4. Describe experimental apparatus and/or models, and analysis procedures in a clear, complete and unambiguous manner making best use of latest information technology. 5. Communicate and present his ideas / work in front of peers and superiors.
95.	VIII	OE4381	Finance for Engineers (Online Course)	<ol style="list-style-type: none"> 1. Discuss the fundamental aspects of accounting and finance. 2. Apply rules of accounting while recording transactions. 3. Prepare financial statements and analyze financial position of the firm by applying various techniques. 4. Describe the various long term sources of finance available for the business organization.
96.	VIII	OE4361	Engineering Management & Economics (Online Course)	<ol style="list-style-type: none"> 1. Develop administrative, organizational and planning skills to execute engineering project. 2. Develop bar chart/mile stone chart for the project. 3. Analyze profit/cost data and carry out economic analysis to take optimal decision. 4. Calculate depreciation as per various methods.
97.	VIII	IP4023	Internship & Project	<ol style="list-style-type: none"> 1. Examine the functioning of the company on the terms of inputs, transformation process and the outputs (products and services) 2. Develop an attitude to adjust with the company culture, work norms, code of conduct. 3. Recognize and follow the safety norms, Code of conduct. 4. Demonstrate the ability to observe, analyse and document the details as per the industry practices. 5. Interpret the processes, systems and procedures and to relate to the theoretical concepts- studies.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 6. Develop the leadership abilities, communication. 7. Demonstrate project management and finance sense 8. Identify the project/problem in the domain of a program relevant for the company. 9. Compile the information to the pertaining to the problem identified. 10. Analyse the information using the statistical tools/ techniques. 11. Develop the feasible solution for given problem. 12. Analyse the impact of the project on the performance of company/department.
98.	VIII	OE4381	Finance for Engineers (Online Course)	<ol style="list-style-type: none"> 1. Discuss the fundamental aspects of accounting and finance. 2. Apply rules of accounting while recording transactions. 3. Prepare financial statements and analyze financial position of the firm by applying various techniques. 4. Describe the various long term sources of finance available for the business organization.
99.	VIII	OE4361	Engineering Management & Economics (Online Course)	<ol style="list-style-type: none"> 1. Develop administrative, organizational and planning skills to execute engineering project. 2. Develop bar chart/mile stone chart for the project. 3. Analyze profit/cost data and carry out economic analysis to take optimal decision. 4. Calculate depreciation as per various methods.
100.	VIII	RE4043	Research Project	<ol style="list-style-type: none"> 1. Investigate the technical literature. 2. Recognize and evaluate theories, practices, and/or research on a chosen topic by conducting a thorough literature review and submitting a written integrative, critical summary of the current literature. 3. Design a research problem and develop a methodology.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 4. Develop and implement an advanced original research or creative project. 5. Develop the ability to explain the conceptual viability of the project and describe the major components involved. 6. Develop the ability to explain how the project will impact the relevant body of work. 7. Develop advanced discipline-relevant skills and competencies. 8. Construct an accurate record of research performed. 9. Write a research report and paper.
101.	VIII	ED4103	Project Management	<ol style="list-style-type: none"> 1. Prepare business Plan for selected business. 2. Make risk analysis& market analysis of selected project. 3. Make risk analysis& market analysis of selected project 4. Make financial appraisal of selected project.
102.	VIII	ED4043	Commercial Aspects of the Project	<ol style="list-style-type: none"> 1. Interpret basic Financial Terminologies. 2. Prepare & analyze financial statements. 3. Prepare financial Plan for venture. 4. Apply basic principles of marketing for various products. 5. Prepare market survey. 6. Apply knowledge of marketing management for selected business.
103.	VIII	ED4063	Entrepreneurship Development Program (EDP)	<ol style="list-style-type: none"> 1. Apply knowledge of engineering, economics, marketing and finance for formulation of business plan, starting & managing new business.
104.	VIII	ED4083	Entrepreneurship Development Project	<ol style="list-style-type: none"> 1. Apply knowledge of engineering, economics, marketing and finance for preparation of project report. 2. Make commercial, technical and financial appraisal of project.

Department Name : Automobile Engineering

PG Program Name : M. Tech. Automotive Technology

Vision and Mission :

Vision :

- To offer programs of global repute with an emphasis on academics, research and innovation to provide competent and efficient human resources in the field of automotive engineering to fulfill the needs of the society.

Mission:

- To design and enrich the curricula based on changing needs of industry and society.
- To develop a center of excellence to promote automotive research and attract industry assignments.
- To provide an excellent academic environment for development of competent automotive professionals to meet industry expectations.
- To ensure participation of every stakeholder to enhance effectiveness of the programs being offered

Sr. No.	Program Outcomes
PO1	An ability to independently carry out research /investigation and development work to solve practical problems.
PO2	An ability to write and present a substantial technical report/document.
PO3	An ability to demonstrate a degree of mastery in Automotive Technology.
PO4	An ability to collaborate, work harmoniously in teams and address multidisciplinary issues with consideration of professional, legal, and ethical issues.
PO5	An ability to use advanced techniques, skills, and modern engineering tools with financial aspects.
PO6	An ability to learn continuously, independently and update knowledge & skills.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
1.	I	MAT101	Vehicular Systems	<ol style="list-style-type: none">1. Explain fundamental concept of the various automotive systems2. Discuss the functions of various automotive systems3. Depict the various systems using simple schematics4. Synthesize mathematical models of the various systems
2.	I	MAT102	Finite Element Analysis	<ol style="list-style-type: none">1. Formulate finite element equation using weighted residual approach.2. Formulate finite element equation using variational approach.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 3. Analyze vector and scalar field problems using FEM. 4. Use isoparametric formulation for irregular geometries. 5. Analyze the dynamic behaviour of structure using FEM.
3.	I	MAT103	Vehicle Dynamics & Control	<ol style="list-style-type: none"> 1. Calculate axle loads under any combination of accelerations, grades, aerodynamic forces etc. 2. Evaluate vehicle acceleration performance in the light of engine power constraint and traction limit constraints. 3. Determine braking performance of vehicle over the range of operating conditions. 4. Evaluate response of vehicle to steering inputs at low and high speeds and its characterization as understeer or oversteer. 5. Estimate ride performance of a vehicle in terms of resonant frequencies, bounce and pitch frequencies.
4.	I	MAT104	Alternative Fuels and Emission	<ol style="list-style-type: none"> 1. Interpret and understand the essential properties, manufacturing techniques and use of liquid fuels in petrol and diesel engines. 2. Analyse the properties, characteristics and the implementation limits of gaseous fuels like LPG, CNG, and HYDROGEN in I.C engines. 3. Explain the formation of pollutants in SI and CI engine and describe the Emission control techniques. 4. Outline the emission measurement techniques and various test procedure
5.	I	MAT105	Automotive Body Structure Design	<ol style="list-style-type: none"> 1. Apply concepts of aesthetics, ergonomics, and aerodynamics to design a vehicle body. 2. Design vehicle body structures as per requirements. 3. Select suitable materials for different body components. 4. Analyze different loading conditions applied on vehicle bodies.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
6.	I	MAT106	Industry 4.0 Technologies	<ol style="list-style-type: none"> 1. Illustrate the drivers and enablers of Industry 4.0. 2. Appreciate the smartness in Smart Factories, Smart cities, smart products and smart services. 3. Outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world. 4. Appreciate the power of Cloud Computing in a networked economy. 5. Outline the opportunities, challenges brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits.
7.	I	MAT107	Automotive Product Design and Development	<ol style="list-style-type: none"> 1. Appreciate the product development process and life cycle in general. 2. Establish target and final specifications of proposed product. 3. Generate, screen and test concepts for proposed product. 4. Apply various tools and techniques like ID, DfX etc. for product development. 5. Perform economic analysis of proposed product.
8.	I	MAT108	Automotive Safety	<ol style="list-style-type: none"> 1. Apply the fundamental concepts of vehicle safety to modern automobiles. 2. Discuss European NCAP-Test for automobiles. 3. Select appropriate crash test to be carried out for any particular collision. 4. Evaluate the level of comfort in any vehicle by developing ergonomics report. 5. Predict appropriate dummy to be used for a specific crash test. 6. Explain advanced safety systems and driver assistance systems.
9.	I	MAT109	Automotive Ergonomics and Aesthetics	<ol style="list-style-type: none"> 1. Apply principles of anthropometry and ergonomics in design of automotive systems. 2. Design a vehicle control and operating system by automotive design standards with regard to ergonomics and aesthetics.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ul style="list-style-type: none"> 3. Design vehicle display, instruments, interior, occupant position for comfort. 4. Analyze the vehicle design on the basis of ergonomic and comfort level. 5. Generate vehicle models by use of techniques in multiple materials.
10.	I	MAT110	Vehicle Aerodynamics	<ul style="list-style-type: none"> 1. Apply basic principles of aerodynamics for the design of vehicle body. 2. Calculate lift and drag of automotive models 3. Discuss the physics of fluid flow over vehicle body and its optimization techniques. 4. Use wind tunnels in testing the vehicles. 5. Apply computational fluid dynamics (CFD) tool for aerodynamics study.
11.	I	MAT111	Tractors and Farm Equipments	<ul style="list-style-type: none"> 1. Describe constructional and operational features of the farm tractor. 2. Evaluate the various mechanizations used in the farm. 3. Analyse the operational features of farm machineries 4. Troubleshoot and carry out basic maintenance of tractors and Farm Equipment's
12.	I	MAT112	Engine and Vehicle Testing Laboratory	<ul style="list-style-type: none"> 1. Describe the operating principle, functions, and constructional details of various engine systems. 2. Conduct the test on single cylinder and multi-cylinder petrol, diesel engine plot the characteristics curves and interpret the curves 3. Determine performance parameters of two & four wheelers 4. Determine vibration characteristics of automotive systems and components 5. Determine sound pressure level in an automobile. 6. Determine performance characteristics of automotive gear box. 7. Determine aerodynamic performance characteristics of car bodies.
13.	I	MAT1113	Modeling Simulation Lab.	<ul style="list-style-type: none"> 1. Develop/ select appropriate model required for simulation.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 2. Apply proper constraints and boundary conditions. 3. Select suitable solver settings of simulation software. 4. Apply different post-processing techniques to interpret the results. 5. Apply optimization tools from simulation software..
14.	I	SHP551	Technical Communication	<ol style="list-style-type: none"> 1. Acquire skills required for good oral and written communication. 2. Demonstrate improved writing and reading skills. 3. Ensure the good quality of oral and written communication.
15.	II	MAT114	Automotive Noise, Vibration and Harshness	<ol style="list-style-type: none"> 1. Demonstrate the significance of experimentation and explore the possibility of carrying out engineering investigations 2. Measure the various technical parameters by instrument and by mathematical relationship 3. Validate actual performance of the system experimentally 4. Analyze experimental test data for further improvement of the system 5. Identify the effect of various parameters on the system and co-relate them
16.	II	MAT115	Hybrid and Electric Vehicles	<ol style="list-style-type: none"> 1. Describe the working principle of electric vehicles. 2. Explain the construction and working principle of various motors used in electric vehicles. 3. Discuss working principle of electronics and sensor less controls in electric vehicles. 4. Describe the different types and working principle of hybrid vehicles. 5. Illustrate the various types and working principle of fuel cells.
17.	II	MAT116	Automotive Electrical and Power Electronics	<ol style="list-style-type: none"> 1. Explain the various automotive sensors and actuators and their use in different automotive applications.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 2. Differentiate various types of vehicle starting, charging system and ignition system. 3. Demonstrate the need and requirement of automobile batteries and its parameters. 4. Compare different automotive lighting systems. 5. Examine different automotive electrical system and auxiliaries. 6. Illustrate different communication protocols and functional safety in automobiles.
18.	II	MAT117	Automotive Testing and Certification	<ol style="list-style-type: none"> 1. Describe requirements of automotive component/systems as per the standards. 2. Demonstrate vehicle and engine test procedures as per standards. 3. Explain testing of automotive components as per standards. 4. Describe xEV test requirements and procedure as per standards.
19.	II	MAT118	Engine Design & Development	<ol style="list-style-type: none"> 1. Explain the various combustion processes in automotive engines. 2. Design and develop the engine using software virtually. 3. Differentiate the need of cooling systems in automotive engine design. 4. Demonstrate latest trends in designing and development of automotive engines.
20.	II	MAT119	Automotive Materials and Manufacturing	<ol style="list-style-type: none"> 1. Describe the types of ferrous & non-ferrous alloys. 2. Analyze the mechanical surface treatment and coatings done on materials. 3. Describe and syntheses the need for modern materials and its alloys. 4. Discuss the materials used to manufacture engine and describe the manufacturing processes. 5. Illustrate materials used in Electric Vehicles.
21.	II	MAT120	Automotive Diagnostics	<ol style="list-style-type: none"> 1. Describe the working principle of networking protocols and ECU.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> 2. Interpret different fault codes and diagnostics techniques used of ECU. 3. Identify the use of different diagnostics tools. 4. Explain the approach techniques used to resolve the issues flagged 5. Illustrate OBD, its tools and techniques.
22.	II	MAT121	Automotive Intelligence	<ol style="list-style-type: none"> 1. Identify the relation between system and signals. 2. Apply the knowledge of intelligence to automotive domain. 3. Explore various tools in the field of intelligence awareness. 4. Apply neural network for automotive application. 5. Analyze the different ways to extract and retrieve information from automobile.
23.	II	MAT122	Autonomous & Connected Vehicles	<ol style="list-style-type: none"> 1. Describe the types of Autonomous Vehicles. 2. Discuss Safety frameworks-ISO 26262. 3. Analyze and syntheses Perception and Planning. 4. Discuss computer visions. 5. Discuss and describe recent trends in Autonomous Vehicles.
24.	II	MAT123	Hydrogen and Fuel Cell	<ol style="list-style-type: none"> 1. Explain various physio-chemical properties of hydrogen. 2. Describe various production techniques and storage methods of hydrogen. 3. Explain the concept- methods and various features related to usage of hydrogen in SI Engines. 4. Explain the concept- methods and various features related to usage of hydrogen in CI Engines. 5. Illustrate the technical features of fuel cells for automotive applications. 6. Outline the design concepts of hydrogen fuel cell systems for road vehicles.
25.	II	MAT124	Research Methodology & IPR	<ol style="list-style-type: none"> 1. Formulate a research problem. 2. Analyze research related information. 3. Use computing tools effectively.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ol style="list-style-type: none"> Describe nature and processes involved in development of intellectual property rights. Prepare and present research proposal/paper by following research ethics.
26.	II	MAT125	Hybrid and Electric Vehicles Laboratory	<ol style="list-style-type: none"> Interpret the impact of different design parameters on electric vehicle performance. Explain the working principle of various motors used in electric vehicles. Examine the performance different types of Hybrid powertrains. Describe the different types and working principle of hybrid vehicles.
27.	II	MAT126	Automotive Noise, Vibration and Harshness Lab.	<ol style="list-style-type: none"> Demonstrate the significance of experimentation and explore the possibility of carrying out engineering investigations Acquire hands on experience on the various test-rigs, experimental set up Measure the various technical parameters by instrument and by mathematical relationship Analyse experimental test data for further improvement of the system Identify the effect of various parameters on the system and co-relate them
28.	II	MAT127	Mini-Project	<ol style="list-style-type: none"> Identify a problem of small magnitude preferably in automotive domain. Analyze the problem with certain objectives and within applicable constraints. Offer/Suggest/Implement innovative solution to the said problem and validate the solution. Communicate the effort through presentation, display and technical report.
29.	III	MAT201	Industry Internship	<ol style="list-style-type: none"> Identify the real applications and practices of course studied, at industry level

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ul style="list-style-type: none"> 2. Recognize various modeling, analysis and validation techniques, at industry level 3. Demonstrate the issues at design, manufacturing and assembly levels 4. Summarize and prepare technical data in report format
30.	III	MOE2010	Artificial Intelligence – Machine Learning	<ul style="list-style-type: none"> 1. Describe central machine learning methods and techniques and how they relate to artificial intelligence 2. Differentiate between supervised and unsupervised learning techniques 3. Apply the ML algorithms to a real-world problem, 4. Optimize the models learned and report on the expected accuracy that can be achieved by applying the models. 5. Evaluate a given problem and apply appropriate machine learning technique.
31.	III	MOE2020	Creative Thinking: Tools & Techniques	<ul style="list-style-type: none"> 1. Comprehend importance in tackling global challenges as well as in everyday problem solving scenarios 2. Apply different brainstorming techniques in group activities 3. Be proficient in the application of the 6 thinking hats tool in different life scenarios 4. Develop a systematic approach to idea generation through the use of morphological analysis 5. Innovate on an existing product, service or situation applying the SCAMPER method 6. Get confident with the theory of inventive problem solving, called TRIZ 7. Select and apply the appropriate technique based on the opportunity to seize or the problem to tackle.
32.	III	MOE2030	MOOC Course	<ul style="list-style-type: none"> 1. Identify the real applications and practices of courses studied, at industry level 2. Recognize various modelling, analysis and validation techniques adopted at industries.

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
				<ul style="list-style-type: none"> 3. Demonstrate the issues at design, manufacturing and assembly levels. 4. Summarize and present technical data in report format.
33.	III	MOE2040	Condition Monitoring and Signal Processing	<ul style="list-style-type: none"> 1. Identify the maintenance scheme, their scope and limitations – apply the maintenance strategies to various problems in the industrial sectors. 2. Analyze for machinery condition monitoring and explain how this compliments monitoring the condition. 3. Develop an appreciation for the need of modern technological approach for plant maintenance to reduce the maintenance expenditure. 4. Emphasizes on case studies that require gathering information using the modern testing equipment and processing it to identify the malfunction in that system. 5. Identify vibration measurement, lubrication oil analysis.
34.	III	MOE2050	Aircraft Conceptual Design	<ul style="list-style-type: none"> 1. Understand the design process of aircraft and decide the aircraft configuration. 2. Choose type of power plant as per flight regime. 3. Decide the fuselage layout as per type of aircraft. 4. Design the wing for type of aircraft and its wing loading. 5. Accurately evaluate lift, drag and mass for design synthesis process. 6. Examine the influence of various design requirements on the configuration of an aircraft to derive an optimized design.
35.	III	MAT202	Dissertation Stage-I	<ul style="list-style-type: none"> 1. Explain the contributions of various researchers in the field of design engg after carrying out literature survey from reputed journals 2. Recognize the gap in the research and define a problem statement 3. Explain significance and applicability of problem statement 4. Summarize and present technical data in report format

Sr. No.	Semester	Course Code	Course Name	Course Outcomes
36.	III	MAT203	Dissertation Stage-II	<ol style="list-style-type: none"> 1. Outline the work plan for problem statement 2. Identify the proper modeling and analysis tool 3. Reproduce the preliminary results of problem statement 4. Summarize and present technical data in report format
37.	IV	MAT204	Dissertation Stage-III	<ol style="list-style-type: none"> 1. Explain the issues related to method adopted in solving the problem 2. Select proper technique in solving the problem 3. Compare the results with available literature
38.	IV	MAT205	Dissertation Stage-IV	<ol style="list-style-type: none"> 1. Design new methodology to address the problem 2. Justify the results obtained from new methodology 3. Write technical report and defend work.