- **Department Name :-Automobile Engineering**

- **UG Program Name :-B.Tech Automobile Engineering**

- **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:-**

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

Sr. No.	Program Outcomes
1.	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2.	Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
3.	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
4.	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
5.	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
6.	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
7.	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
8.	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9.	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10.	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
11.	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
12.	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
1.	Diagnose the automotive system failures and repair / replace the components / systems so as to bring the vehicle in original condition.
2.	Perform the role of motor claim approver and loss assessor with confidence and competence.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
1.	I	**SH131**	**Engineering Physics**	1	Use the principles of interference, diffraction and polarization in thin reflecting films, diffraction gratings and polarimeter.
				2	Apply the knowledge of architectural acoustics for acoustically good halls and principle of magnetostriction and piezoelectric methods for production of ultrasound.
				3	Apply the Newton's laws of motion to calculate forces acting on objects.
				4	Describe the behavior of a damped and driven harmonic oscillator
				5	Use the knowledge of semiconducting materials in semiconductor devices
				6	Explain the basics of laser production and its applications.
2.	I	**SH1053**	**Engineering Mathematics**	1	Sketch the curve with full justification
				2	Apply the properties of special functions to evaluate integral.
				3	Evaluate double integral and change the order of the integration.
				4	Evaluate area bounded between two curves, mass of lamina, moment of inertia
				5	Prove the results of partial differentiation.
				6	Apply partial differentiation for evaluating and proving the results based on errors and approximations, maxima and minima.
3.	I	**SH1132**	**Engineering Graphics**	1	Determine the location and orientation of point, line, and plane with respect to reference planes to draw their projection.
				2	Develop the projection of various types of solids in various conditions
				3	Develop section views and true shape section of various types of solids.
				4	Identify the need of development of lateral surfaces and apply the same in engineering drawing.
				5	Develop orthographic views of an object to convert pictorial view into two-dimension (2D) view.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				6	Develop isometric view to convert two-dimension (2D) view to pictorial view.
4.	I	**SH187**	**Engineering Physics Lab**	1	Apply the theory of semiconductors to calculate band gap energy and carrier concentration.
				2	Apply theory of interference and grating to calculate radius of curvature of plan convex lens and wavelength of light.
				3	Compare b-h curve for different ferromagnetic materials and measure hysteresis loss in it.
				4	Use ultrasonic interferometer to calculate velocity of ultrasound in given liquid.
				5	Use Laurent's half shade polarimeter to calculate specific rotation of optically active solution.
				6	Verify Newton's laws of motion and phenomena of resonance in forced oscillations.
5.	I	**SH1552**	**Engineering Graphics Lab**	1	Determine the location and orientation of point, line, and plane with respect to reference planes to draw their projection.
				2	Develop the projection of various types of solids in various conditions.
				3	Develop section views and true shape section of various types of solids.
				4	Identify the need of development of lateral surfaces and apply the same in engineering drawing.
				5	Develop orthographic views of an object to convert pictorial view into two-dimension (2D) view.
				6	Develop isometric view to convert two-dimension (2D) view to pictorial view.
6.	I	**SH189**	**Engineering Explorations and Design Project**	1	Explain the role of an engineer as a problem solver.
				2	Design engineering solutions to complex problems utilizing multi-disciplinary systems approach.
				3	Examine a given problem using process of engineering problem analysis.
				4	Build simple systems/prototypes using engineering design and development process.
				5	Analyze engineering solutions from ethical and sustainability perspectives.
				6	Apply basics of engineering project management skills in project development.
7.	I	**SH 1831**	**English Proficiency Lab I**	1	Demonstrate Language Reception skills
				2	Communicate using Oral and written modes
				3	Make use of English Language with grammatical accuracy
				4	Articulate correctly the frequently used words.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
8.	I	**SH 1582**	**Japanese Language Lab Level I**	1	Demonstrate Japanese script through oral and written communication
				2	Express themselves by using simple sentence and responses to question
				3	Demonstrate effective listening
				4	Make use of Japanese etiquette.
9.	I	**SH 1601**	**German Language Lab Level-I**	1	Make use of everyday Expressions and basic phrases
				2	Express himse/herself and answer questions regarding personal details
				3	Interact in simple way
				4	Make use of basic grammar concept correctly.
					Demonstrate reading and writing skills
10.	I	**SH 185**	**Engineering Practice Lab I**	1	Acquire skills in basic engineering practice
				2	Use of Hand tools and power tools
				3	Develop sheet metal model
				4	Understand various operations in machine shop
				5	Perform different joining operations.
				6	Perform Pipe Fitting operations.
11.	I	**SE1052**	**Basics of Electronics Engineering Lab**	1	Demonstrate the importance of various electronic components and equipments for various applications.
				2	Test performance and applications of electronic devices, gates.
				3	Develop technical writing skills and teamwork abilities for working effectively in groups.
				4	Design and simulate analog and digital circuits using simulation tools.
12.	II			1	Understand basic concepts of chemistry.
				2	Select the correct instrumental techniques for the examination of materials.
				3	Demonstrate knowledge of science behind normal polluting influences in water and strategies to treat them.
				4	Utilize the electrochemical principle for selection of proper batteries.
				5	Apply the science for understanding corrosion and its prevention.
				6	Compare types and quality of fuels by different instruments and select the proper lubricant and lubrication method.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
13.	II	**SH1023**	**Engineering Mathematics II**	1	Use the concepts of matrices that serve as an essential basis for several computational techniques.
				2	Solve the differential equations by choosing proper method of solution.
				3	Solve the problems on orthogonal trajectories, simple electrical circuits, and heat flow by applying the methods of ordinary differential equations.
				4	Use the relevant method for solving simultaneous algebraic linear equations.
				5	Apply the relevant numerical method for interpolating the polynomial.
				6	Apply appropriate numerical method to compute the solution of ordinary differential equations.
14.	II	**SH1291**	**Electrical Engineering**	1	Solve magnetic circuits, d.c. and a.c. electric circuits
				2	Discuss construction, working and application of transformers.
				3	Discuss construction, working and application of different types of commonly used rotating machine.
				4	Classify power converters on the basis of application.
				5	Suggest suitable capacity of wires, cables switchgear and illumination system for electrical installations.
15.	II	**SH133**	**Programming for Problem Solving**	1	Explain the basic terminology and concepts of c programming language.
				2	Write algorithm and draw flow chart for the given problem.
				3	Write a c programs to solve given problems.
				4	Analyze the given c program to predict the output.
				5	Evaluate the c program to resolve the errors.
16.	II	**SH1532**	**Engineering Chemistry Lab**	1	Examine the materials by using analytical instruments.
				2	Identify the quality of water for industrial and domestic purposes.
				3	Apply the knowledge of electrochemistry for the design of various cells and batteries.
				4	Select proper lubricant for different machines according to working condition.
				5	Inspect the quality of fuel.
17.	II	**SH1791**	**Electrical Engineering Lab**	1	Acquaint with the basic concepts and properties of electrical circuits and awareness about safety precautions.
				2	Select proper meter/s for measuring electrical quantities during experiments.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				3	Explain various electrical circuits (dc, ac) and magnetic circuits through laboratory practices.
				4	Demonstrate various power converter for desired application.
				5	Choose circuit breakers for specific application
18.	II	**SH191**	**Programming for Problem Solving Lab**	1	Describe orally the basic terminology and concepts of c programming language
				2	Write an algorithm and flow chart for the given problem.
				3	Write a 'c' programs for a given problem
				4	Compile the 'c' program to remove the syntactical error.
				5	Debug the c program to remove the logical errors and execute the code to get correct output
19.	III	**SH2031**	**Engineering Mathematics - III**	1	Solve differential equations using various properties.
				2	Apply appropriate method of solution to the given differential equation.
				3	Apply techniques of solution of higher order linear ordinary and partial differential equation to solve specific engineering problems.
				4	Solve engineering problems using laplace transform.
				5	Apply rules of vector differential calculus to evaluate gradient, divergence and conservative vector field.
				6	Apply Fourier transforms to solve the differential equations in engineering problems.
20.	III	**AE 2531**	**Material Science and Metallurgy Lab**	1	Select suitable heat treatment process.
				2	Apply Powder metallurgy method for production of metal with advanced properties
				3	Select Appropriate material for particular application
				4	Identify internal and external defect
				5	Select heat treatment to change material properties
21.	III	**AE259**	**Mini Project on Envir. Sci**	1	Utilize scientific methods to solve environmental problems
				2	Examine technologies for restoration of degraded environment
				3	Develop presentation and report writing skills
				4	Develop as an individual and in group leadership quality.
22.	III	**SH2011**	**Environmental Science**	1	Explain the importance and sensitivity of environment.
				2	Interpret over exploitation of natural resources and follow environmental ethics.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				3	Explain methods to protect environment and prevent environmental pollution.
				4	Apply their knowledge and skills to solve their environment related problems.
				2	Evaluate the performance of air conditioning test bench and heat pump test rig.
				3	Demonstrate fire-tube and water-tube boilers.
23.	III	**AE2031**	**Applied Thermodynamics**	1	Explain energy, heat and work interaction.
				2	Use the steam table and Mollier chart to compute thermodynamics correlations.
				3	Apply the laws of thermodynamics to various flow and non-flow processes.
				4	Analyze the performance of various power cycles.
				5	Describe various methods of refrigeration and air-conditioning
24.	III	**AE2551**	**Fluid and Thermal Engineering Lab. 1**	1	Verify and apply Bernoulli's theorem
				2	Calibrate different apparatus of fluid flow measurement
				3	Calculate various losses through pipes
				4	Evaluate properties of lubricants
				5	Demonstrate construction and working of steam boilers
				6	Conduct trial on refrigeration and air conditioning bench
				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.
25.	III	**AE259**	**Mini Project on Environmental Science**	1	Utilize scientific methods to solve environmental problems.
				2	Evaluate technologies for restoration of degraded environment.
				3	Develop presentation and report writing skills.
				4	Develop as an individual and in group leadership quality.
26.	III	**AE2051**	**Fluid Mechanics**	1	Determine various properties of fluids.
				2	Solve fluid static, fluid kinematic and fluid dynamic problems.
				3	Design of piping systems considering losses in pipes.
				4	Construct fluid flow models using Dimensional Analysis techniques.
				5	Calculate drag and lift forces on body subjected to external fluid flow.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				6	Analyze compressible fluid flow
				2	Perform turning, parting, knurling and threading operations on lathe.
				3	Describe working of milling, grinding and shaping machine.
27.	III	**AE2071**	**Material Science and Metallurgy**	1	Explain the importance of engineering materials and crystal structures.
				2	Analyze different phases in a compound at any temperature.
				3	Suggest appropriate heat treatment process & mechanical testing method for a given application.
				4	Suggest suitable material for a particular application.
28.	III	**AE2511**	**Technical Skill Lab**	1	Demonstrate the tool grading and lathe machine.
				2	Perform various turning operations on the given job by referring drawing.
				3	Perform various parting operations on the given job by referring drawing.
				4	Perform knurling operations on the given job by referring drawing.
				5	Perform threading operations on the given job by referring drawing.
29.	III	**AE2571**	**Machine Drawing Lab**	1	Represent the automotive and mechanical components and materials with their conventions.
				2	Develop an ability to prepare free hand sketches with proportionate dimensions..
				3	Apply AutoCAD or similar software for drawing machine components and assemblies.
				4	Develop an ability to prepare details and assembly drawings as per standard procedure.
				5	Prepare the production drawing of the given system before it is given to manufacturing.
30.	IV	**AE2021**	**Numerical Methods**	1	Apply numerical methods to solve algebraic and transcendental equations.
				2	Solve engineering problems using optimization techniques.
				3	Apply statistical techniques and distribution concepts to evaluate real life problems.
				4	Apply numerical integration methods to solve engineering problems
				5	Solve differential equations using computational methods
31.	IV	**AE2041**	**Kinematics of Machines**	1	Select appropriate mechanism to design and develop a machine for any application.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				2	Determine velocity and acceleration of various links of a mechanism.
				3	Generate profile of cam to get required follower motion for any application.
				4	Plot characteristics of porter and Hartnell governor.
				5	Select the lower pair mechanism to meet the need where they are suitable.
				6	Explain friction principles in relation to automotive and mechanical applications.
32.	IV	**AE2061**	**Heat Transfer**	1	Illustrate the modes of heat transfer.
				2	Develop mathematical model for heat conduction in different coordinate system and heat transfer from extended surfaces for different conditions.
				3	Analyze forced and free convection heat transfer situations.
				4	Apply the principles of radiation heat transfer to engineering problems.
				5	Explain mechanism of boiling and condensation.
				6	Design heat exchanger on the basis of sizing or rating constraints.
33.	IV	**AE2081**	**Strength of Materials**	1	Apply fundamental concepts of stress, strains & material properties for static analysis.
				2	Select proper beam for structural applications.
				3	Apply the stiffness criteria for the beam analysis.
				4	Compare different columns on the basis of end conditions.
				5	Analyze the circular shaft subjected to pure torsion.
				6	Apply energy method for structural analysis of solid body.
34.	IV	**AE2521**	**Foundry Practices and Electrical Lab**	1	Evaluate properties of moulding sand.
				2	Select appropriate moulding sand for a given application.
				3	Compute properties of mould.
				4	Evaluate the performance of dc machine by testing.
				5	Plot the characteristic curve for dc machine
35.	IV	**AE2541**	**Fluid and Thermal engg. labII**	1	Draw performance characteristic curves for pumps, compressors and turbines.
				2	Evaluate various efficiencies of pumps, compressors and turbines.
				3	Explain construction and working of various Hydraulic devices.
				4	Determine thermal conductivities of various materials.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				5	Estimate heat transfer coefficient in natural and forced convection environment.
				6	Determine surface emissivity of a test plate.
				7	Compute efficiency of heat exchanger.
				8	Design Heat exchanger using C- programming.
36.	IV	**AE2561**	**CAD lab**	1	Develop base feature for modeling of parts.
				2	Develop 3d model of automotive components.
				3	Assemble components using functional constraints.
				4	Prepare production drawing in drafting workbench.
37.	IV	**AE2101**	**Fluid Machines**	1	Explain working principle of various fluid machines.
				2	Develop velocity triangles required for analysis of various fluid machines.
				3	Explain various performance characteristics of various fluid machines.
				4	Select pump, compressor and turbine for given application.
38.	IV	**AE2121**	**Electrical Technology**	1	Explain construction and working of ac & dc machine
				2	Calculate parameters of electric machine
				3	Analyze performance of electric machine
39.	V	**AE3051**	**Automotive Chassis Systems**	1	Elaborate the constructional details and operations of chassis systems like steering system, suspension system etc.
				2	Interpret the underlying mechanics of the chassis systems.
				3	Apply steering geometry for a given vehicular application.
				4	Select/configure components or subsystems for integration into main chassis system.
				5	Explain various advanced chassis systems like adaptive suspensions, TCS etc.
40.	V	**AE3071**	**Automotive Transmission**	1	Demonstrate the need of transmission and its classification.
				2	Describe the construction and working of various types of clutches and gear boxes.
				3	Explain the working of advanced transmission systems.
				4	Describe the working of final drive.
				5	Select appropriate transmission system.
41.	V	**AE3131**	**Internal Combustion Engines**	1	Perform a primary thermodynamic analysis of otto and diesel cycle engines.
				2	Select appropriate engine for specific application.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				3	Select proper fuel system and subsystems for i c engine.
				4	Conduct performance testing of the i c engine and portray operating characteristics of i c engines.
				5	Select proper lubricant and lubrication system for engine.
42.	V	**AE3531**	**Automobile Engineering Lab 1**	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 transmission and chassis systems.
				4	Compare various configurations/sub types of transmission & chassis systems.
				5	Select appropriate configuration/types for transmission and chassis system requirements in automotive applications.
43.	V	**AE3511**	**Theory of Machines Lab**	1	Generate a gear tooth profile for any application.
				2	Determination of gyroscopic couple and verification of gyroscopic law.
				3	Plot polar diagram based on the experimental readings on hook's joint.
				4	Generate a cam profile for any application.
				5	Plotting of characteristic curves for porter governor.
				6	Determination of moment of inertia of rigid bodies.
				7	Apply balancing methods to balance rotating and reciprocating components.
				8	Analyze vibrations of single degree of freedom systems.
				9	Determine critical speed of shafts.
44.	V	**AE3611**	**I C Engine Lab**	1	Demonstrate the construction and working of fuel supply system and its components, lubrication, cooling systems.
				2	Handle instruments like tachometer, thermometer, digital temperature indicator etc.
				3	Conduct the test on single cylinder and multicylinder petrol, diesel engine plot the characteristics curves and interpret the curves
				4	Calculate bp, ip, fp, air - fuel ratio and various engine efficiencies
				5	Conduct the test and prepare heat balance sheet.
45.	V	**AE3551**	**Metrology and Quality Control Lab**	1	Identify various of manual & instrumental errors & take proper cares to prevent them while using measuring instrument

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				2	Measure angle of tapered components, template & thread form using tool maker's microscope, sine bar and with standard balls and rollers.
				3	Measure, analyze & interpret the data obtained from different measurements.
				4	Plot "x bar" & "r" charts & comment on whether the manufacturing process is in control or not. if not, suggest the means to bring the process in statistical control
46.	V	**AE3591**	**Practicing School I**	1	To acquaint with garage environment and process to be carried out
				2	Handle various tools and equipment used in garages.
				3	Diagnose minor faults of vehicle.
				4	Summarize the uses of advanced tools and equipment.
				5	Communicate and present his ideas / work in front of peers and superiors.
47.	V	**AE3091**	**Industrial Organization and Management**	1	Explain the basic functions of management.
				2	Describe the basic concepts of functional areas of management.
				3	Apply basic concepts of management in an industry.
				4	Gain an insight into entrepreneurship management.
48.	V	**AE3111**	**Metrology and quality control**	1	Select appropriate instrument/s for specific measurement
				2	Explain principle, working of various measuring instruments
				3	Construct and draw the control charts
				4	Design gauges and special inspection fixtures as per the requirement
				5	Analyse and interpret the data obtained from the different measurements, processes and present it in the graphical form, statistical form
49.	V	**AE3011**	**Dynamics of Machines**	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.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
50.	VI	**AE3021**	**Machine Design**	1	Discuss steps of design and steps of machine design elements.
				2	Design joints for different loading conditions.
				3	Design shafts keys and couplings to transmit required amount of torque.
				4	Design four types of gears namely spur, helical, bevel and worm by using different considerations.
				5	Design basic components like spring and levers.
51.	VI	**AE3081**	**Alternative Fuels and Emission**	1	Describe various alternative fuels for IC engines and fuel cells in terms of properties and its performance characteristics
				2	Analyze the pollutant formation mechanisms in IC engine emissions
				3	Illustrate the knowledge of emission norms, standard test procedures and emission measurements techniques
				4	Analyze different emission control technologies in IC engines
52.	VI	**AE3061**	**Automotive Electrical and Electronics**	1	Describe the role of the electrical and electronics in controlling various automotive functions and subsystems
				2	Select automotive electrical systems like battery, alternator, starting systems, ignition system for particular application.
				3	Describe various advanced electronic systems used in modern road vehicles.
				4	Select sensors and actuators used for automotive systems.
53.	VI	**AE3121**	**Vehicle Body and structure**	1	Apply various concepts of vehicle aerodynamics while designing a car body.
				2	Differentiate vehicle bodies
				3	Apply various concepts of aesthetics and ergonomics while designing a vehicle body.
				4	Select materials for different components of vehicle
				5	Design body for different loading conditions
54.	VI	**AE3101**	**Automotive Dignostics**	1	Describe the importance and significance of automotive maintenance and records.
				2	Select advanced equipments and machines used in automotive maintenance.
				3	Troubleshoot and carry out basic maintenance of automotive systems.
				4	Discuss the developments in automotive maintenance technology.
55.	VI	**AE3141**	**Control Engineering**	1	Explain various control systems.
				2	Model the control system mathematically for formation of Block diagram.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				3	Apply linearization technique to non linear control systems.
				4	Analyze control systems using different mathematical tools.
				5	Verify stability of given control system using different techniques.
				6	Represent control systems using state space technique.
56.	VI	**AE3521**	**Auto Engg. Lab-2**	1	Compare various vehicle body layouts and interpret the differences therein
				2	Apply the concepts of human ergonomics for vehicle body engineering
				3	Demonstrate the construction and working of various automotive electrical systems.
				4	Diagnose/test various automotive electrical components and systems using testing instruments.
				5	Diagnose the automotive electronic system faults with the help of ecu diagnostic system.
57.	VI	**AE3601**	**Auto diagnostic lab**	1	Identify problems in ic. engine systems by performing engine tune up
				2	Illustrate critical inspection parameters while engine top overhaul
				3	Perform wheel alignment and wheel balancing
				4	Test spark plug and fuel injector to check performance as per their specification
				5	Diagnose clutch, gearbox, braking system, differential and axles for its trouble shooting
				6	Measure wear of engine components
58.	VI	**AE3581**	**Mini Project/ technical theme**	1	Identify the problem on the basis of literature survey
				2	Ability to provide creative solution to engineering problem
				3	Work as individual or member of team
				4	Prepare cad model of engineering system using suitable software
				5	Communicate findings by verbally and non-verbally
59.	VI	**AE3621**	**Measurement and Control Lab**	1	Use various instruments for measurement of force, pressure, velocity etc.
				2	Calibrate the measuring instruments.
				3	Compare different methods of measurement.
				4	Analyse Control Systems using MATLAB programming.
	VI	**AE3641**	**Semester**	1	Identify advance topics in automotive engineering through various resources
				2	Carryout literature survey on selected topic
				3	Organize content of selected topic in

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
					presentable form
				4	Prepare a formal report of the collected data
				5	Present advance topic in front of peers and superiors
60.	VII	**AE4011**	**Engine Design**	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 cooling and lubrication systems.
				5	Select proper bearings.
61.	VII	**AE4051**	**Finite Element Methods**	1	Discretize the physical domain using appropriate elements and check the quality of mesh
				2	Develop FEA codes for analysis of structural problems
				3	Analyze thermal problems using FEA.
				4	Use isoparametric formulation for irregular geometries.
				5	Analyze natural frequency of structure.
62.	VII	**AE4531**	**Engine Design Lab.**	1	Measure dimensions of given engine components.
				2	Prepare cad models and assembly of measured engine components.
				3	Design the components of engine for given requirements.
				4	Develop the cad model of designed engine components.
63.	VII	**AE4551**	**Vehicle Testing and Emission Lab.**	1	Explain the measurement system for automotive testing.
				2	Analyze performance of two and four wheelers.
				3	Select appropriate sensor for measurement of noise and vibrations in the vehicles.
				4	Determine modal parameters of automotive components.
				5	Analyze performance of automotive engines.
				6	Analyze i.c. engine emissions of petrol and diesel engines
				7	Compare i.c. engine emissions with air fuel ratio
64.	VII	**AE4571**	**Project Phase - I**	1	Carry out literature survey and identify as well as select a problem.
				2	Comprehend and analyse an engineering problem and report findings to provide an appropriate solution.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				3	Design an experimental setup or develop an analytical model to analyze the system under consideration.
				4	Communicate problem, methodology and outcomes in a systematic and effective way 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 arrive at a solution to the given problem.
				7	Demonstrate ethical behaviour while completing the project work within given constraints and while delivering the expected outcomes
65.	VII	**AE4021**	**Automotive System Design**	1	Design of clutch for automotive application.
				2	Design gear box 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.
66.	VII	**AE4041**	**Vehicle Dynamics**	1	Calculate dynamic longitudnal and transverse axle load transfer for a vehicle in motion.
				2	Determine the acceleration and braking performance of a vehicle when provided with specifications.
				3	Evaluate handling characteristics of a vehicle for a given set of data.
				4	Apply ride concepts while designing a suspension system for a vehicle.
67.	VII	**AE4522**	**Automotive System Design Laboratory**	1	Design automotive clutch assembly
				2	Design automotive gear box assembly.
				3	Draw / Sketch clutch and gear box details and assembly using suitable modeling software.
68.	VII	**AE4561**	**Software Proficiency**	1	Explain user interface of the software.
				2	Develop appropriate model required for simulation.
				3	Apply proper constraints and boundary conditions
				4	Select suitable solver settings of simulation software.
				5	Apply different post processing techniques to interpret the results.
				6	Optimize the engineering problems using simulation software.
69.	VII	**AE4541**	**Ethics in Engineering**	1	Demonstrate knowledge of ethical practices and professional expectations.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
			Profession	2	Analyseand evaluate practices carried out in the industry on the basis of ethicality
70.	VII	**AE4231**	**Transport Management**	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.
71.	VII	**AE4061**	**Electric and Hybrid Vehicles**	1	Appreciate the need of evs and hevs in today's transportation context and identify various elements evs and hevs.
				2	Describe and compare ev and hev technology in general.
				3	Design an electric vehicle for given requirements.
				4	Design a hybrid electric vehicle for given requirements.
				5	Elaborate fuel cell technology for vehicular application.
72.	VII	**AE4171**	**Motor Insurance Practices**	1	CO1: Classify motor vehicle insurances
				2	CO2: Discuss applications of insurance principles in vehicle insurance
				3	CO3: Describe various forms in motor vehicle insurance
				4	CO4: Discuss mact in detail
				5	CO5: Analyze fraud management and internal audit in relation with motor vehicle insurance
				2	Identify fluid power system components.
				3	Design hydraulic and pneumatic circuits for given problems.
				4	Diagnose probable causes of failure of components of hydraulic and pneumatic circuits.
73.	VIII	**AE4141**	**Product design and development**	1	Appreciate the product development process in general
				2	Establish target and final specifications of proposed product.
				3	Generate, screen and test concepts for proposed product
				4	Apply various techniques like industrial design, dfx for a proposed product.
				5	Perform economic analysis of proposed product.
74.	VIII	**AE4101**	**Vehicle maintenance management**	1	Distinguish between preventive and breakdown maintenance and its management.
				2	Prepare automotive dealership layout and its requirements.
				3	Apply concepts of management in parts ordering and servicing.

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
				4	Illustrate management tools for showroom and service sector automobile industry.
				5	Interpret and summarize multi-brand workshop management
75.	VIII	**AE4151**	**Vehicle Aerodynamics**	1	Apply basic principles of aerodynamics for the design of vehicle body.
				2	Calculate lift and drag of automotive models
				3	Describe the physics of fluid flow over vehicle body and its optimization techniques.
				4	Use wind tunnels for testing the vehicles.
				5	Apply computational fluid dynamics (CFD) tool for aerodynamics study.
76.	VIII	**OE402**	**Renewable energy sources**	1	Identify the need of requirement of renewable energy source
				2	Summarize the various available energy sources.
				3	Illustrate different technologies essential for conversion of renewable energy sources.
				4	Evaluate the performance of energy conversion systems for maximum efficiency
				5	Compare the various renewable energy technologies.
				6	Select appropriate renewable energy technology for specific application
77.	VIII	**AE462**	**Hydraulics and Pneumatic lab**	1	Identify and draw fluid power symbols.
				2	Select proper components to build fluid power circuit.
				3	Develop required circuits using selected components.
78.	VIII	**AE464**	**Product design and development lab**	1	Illustrate the use of physical prototype models for evaluating product concept
				2	Apply theoretical knowledge to design and develop physical products using clay, wood, sheet metal and rp techniques
79.	VIII	**AE4581**	**Project Phase- 2**	1	Identify the problem on the basis of literature survey
				2	Analyze the alternative solution for selected engineering problem.
				3	Design an experimental setup or develop an analytical model to analyze the system under consideration.
				4	Communicate problem, methodology and outcomes in a systematic and effective way 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 arrive at a solution to the given problem.
				7	Demonstrate ethical behavior while completing the project work within given constraints and

Sr. No.	Semester	Course Code	Course Name	Course Outcome	
					while delivering the expected outcomes
80.	VIII	**AE4111**	**Automotive Safety**	1	Comprehend application of passive and active safety for vehicle.
				2	Describe importance of ergonomics in automotive safety and human response to impact
				3	Design vehicle safety systems
				4	Describe various regulations of vehicle safety and safety testing methods.
				5	Apply principle of collision to vehicle crash mechanism