

DEPARTMENT OF MECHANICAL ENGINEERING
Program outcomes Detail B. Tech. (Automobile engineering)

Sr. No.	Academic contents	Types of contents	Outcomes
1.	Programme outcome	B. Tech (Automobile engineering)	<ol style="list-style-type: none"> 1. An ability to apply knowledge of mathematics, science and engineering in practice 2. An ability to identify, critically analyze, formulate and solve engineering problems 3. An ability to select appropriate engineering tools and techniques and use them with dexterity 4. An ability to design a system and process to meet desired needs within realistic constraints such as health, safety, security and manufacturability 5. An ability to devise and conduct experiments, interpret data and provide well informed conclusions 6. An ability to understand the impact of engineering solutions within purview of laws, in a contemporary, global, economical, environmental, and societal context for sustainable development 7. An ability to function professionally with ethical response ability as an individual as well as in multidisciplinary teams with positive attitude 8. An ability to communicate effectively 9. An ability to appreciate the importance of goal setting and to recognize the need for life-long learning 10. To produce well informed socially responsible global citizen with sharp critical thinking skills having sound awareness about finance management, engineering laws and human rights, ethics and values. They will have entrepreneurial spirit.

Sr. No.	Academic Contents	Types of Contents	Specific Outcomes
2.	<u>Program Specific outcomes</u>	B. Tech. (Automobile Engineering)	<p>Modern automotive industries need experts in vehicle design and manufacture. Each student will attain at least the following outcomes from this B. Tech degree course. The specific outcomes are---</p> <ol style="list-style-type: none"> 1. Expertise in the area of automobile engineering 2. Broad exposure of automobile engineering 3. To give students a broad exposure to the design, development, and testing of automobiles. 4. To meet the technological challenges and trains them to meet the technological challenges and diverse needs of the industry and society in various areas of automobile engineering 5. Equips them to excel in a truly competitive industry. 6. They specialize in IC Engines, Alternative, Fuels, Automotive Technology, Automotive Design, Production, and Thermal & Electric Vehicles. 7. To train them in the areas of alternative fuels, Engine systems, vehicle dynamics and new trends in engine design. 8. To prepare graduates who will be successful in their profession in industries, government, academia, research and consulting firms and who will thrive to pursue life-long learning to fulfill their dreams. 9. To make students capable of <ol style="list-style-type: none"> a) computer simulation of I.C engine processes b) hybrid, electric and fuel-cell vehicles c) electronic engine management systems d) heat, ventilation and air conditioning e) tyre technology f) auxiliary engine systems g) maintenance of automobiles h) vehicle maintenance 10. capable of attaining the confidence in the field of Automotive Engineering, innovative designs and presentations, thereby approaching a positive growth for along with the cherished reputation

			<ol style="list-style-type: none"> 11. To give them Good knowledge of automotive components and machineries. 12. Provide the Ability to absorb the concerned problem at first instance and provide the suitable remedial measure to the problem. 13. And proficient at designing innovative projects. 14. Make them Instrumental in designing the fuel efficient engine for Car 15. To Achieve the cost-effective and fuel-efficient compilation of the automotive generator mode 16. To Train them to ensure the work quality in accordance with the compliance. 17. To Provide the Ability to co-ordinate with the suppliers, technician and technologists to meet the target up to end user satisfaction 18. To Provide the Excellent communication skill with good grasping aptitude of the automobile equipment. 19. To provide the technical abilities coupled with robust people handling skills can help in bringing efficiency in servicing of clients. 20. To make them Responsible for managing customer complaints with respect to maintenance and service of vehicle 21. To make them Perform complex technical operations involving the selection of apt equipments and techniques for achieving desired results in a cost-effective manner 22. To give them sound problem solving ability along with people management 23. To make them Efficient at gathering the news and details, compiling, comprehending and designing a presentable format for the automobiles 24. To develop and understand the principles of conversion in design, construction and working of <i>mechanical</i> systems and electronic systems in automobiles.
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Till fifth semester the courses are same as in mechanical engineering. The course outcomes have been given earlier with mechanical. From sixth semester onwards the automobile courses outcomes are given as below

Course Outcome

B.Tech. (Automobile Engineering)

Sr. No.	Academic contents	Types of Contents	Outcomes
3.	Course outcome	MEL 0618 Dynamics Of Machines (6th semester) Credits (3-1-2)5	CO1 Understanding D'Alemberts principle, inertia force and inertia torque CO2 Understanding Turning moment diagram for single cylinder double acting steam engine, CO3 Understanding Types of governors, terms used in governors CO4 Understanding, balancing of rotating masses CO5 Understanding Types of free vibrations, natural frequency of free longitudinal 3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester
		MEL0619 Heat and Mass Transfer (6th semester) Credits (3-1-2)5	CO1 Understanding Mechanism of Heat Transfer, Conduction, Convection and Radiation, General Differential equation of Heat Conduction. CO2 Understanding Convective Heat Transfer Coefficients, Boundary Layer Concept, Types of Convection, Forced Convection, Dimensional Analysis, External Flow, Flow over Plates, Cylinders and Spheres, Internal Flow, Laminar and Turbulent Flow, Combined Laminar and Turbulent, CO3 Understanding the Laws of Radiation, Stefan Boltzman Law, Kirchhoff Law, Black Body Radiation, Grey body radiation. CO4 Understanding Diffusion Mass Transfer, Fick's Law of Diffusion, Steady state Molecular Diffusion, Convective Mass Transfer, Momentum, Heat and Mass Transfer Analogy CO5 Understanding Nusselts theory of condensation, pool boiling, flow boiling, correlations in boiling and condensation. Types of Heat Exchangers, LMTD Method of heat Exchanger Analysis,

			<p>Effectiveness, NTU method of Heat Exchanger Analysis, Overall Heat Transfer Coefficient, Fouling Factors.</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p>
		<p>MEL0601 Automotive Transmissions (6th semester)</p> <p>Credits (3-1-2)5</p>	<p>CO1 Understanding Requirement of transmission system, types of transmission system, requirement and function of clutches, classification of clutches, principle of friction clutch</p> <p>CO2 Understanding Determination of gear ratio for passenger car, heavy vehicle and tractors. Performance characteristics at different speeds, Objectives and need of gear box in a vehicle</p> <p>CO3 Understanding Fluid coupling: Principle of operation, constructional details, torque capacity, performance characteristics, reduction of drag torque</p> <p>CO4 Understanding Introduction to epicyclic gear train – external mesh and internal mesh planetary gear trains, Ford T-model gear box. Wilson gear box</p> <p>CO5 Understanding Hydrostatic drive, Electric drives</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p>
		<p>AEL 0603 Automotive Chassis (6th semester)</p> <p>Credits (3-1-0)4</p>	<p>CO1 Understanding Types of chassis layout with reference to engine and drive, various types of frames. Loads acting on vehicle frame, constructional details and materials for frames. Testing of frames</p> <p>CO2 Understanding effect of drive line , differential principle final drive , four wheel drives</p> <p>CO3 Understanding Construction and design of drive axles, types of loads acting on drive axles, full – floating, three–quarter floating and semi–floating axles, axle housings and types.</p> <p>CO4 Understanding the Need for Suspension System, Types of Suspension System, Constructional details and characteristics of Single Leaf, Multi–Leaf, Coil,</p> <p>CO5 Understanding the Theory of braking, necessity of brake, factor influencing brake performance \</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p>
		<p>AEL 0604 Vehicle Body Engineering (6th semester)</p>	<p>CO1 Understanding Types - saloon, convertibles, limousine, estate van, racing and sports car. Visibility:</p>

		Credits (3-0-0)3	<p>CO2 Understanding Vehicle drag and types, various types of forces and moments and their effects, side wind effects; various body optimization techniques for minimum drag</p> <p>CO3 Understanding Types: mini bus, single and double decker, two levels, split level and articulated bus.</p> <p>CO4 Understanding Different types of commercial vehicle bodies, light commercial vehicle body types, construction</p> <p>CO5 Understanding Aluminum alloy sheet, extrusion and casting, stainless steels, alloy steels, metal matrix composites, structural timbers</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p>
B. Tech Automobile Engineering Honors Elective-II	AEH/MEH 0607 TOTAL QUALITY MANAGEMENT (6th semester)	Credits (3-1-0)4	<p>CO1 Understanding Evolution of TQM, need for quality, basic concepts and barrier to TQM</p> <p>CO2 Understanding TQM principle , leadership team work , motivations PDSA cycle</p> <p>CO3 Understanding Tools and Techniques in TQM:</p> <p>CO4 Understanding Function Deployment and Failure Modes Effects Analysis</p> <p>CO5 Understanding Quality Management Systems Product Acceptance Control</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester</p>
Course outcome	AEL 0705 Vehicle Body Engineering (7th semester)	Credits (3-1-0)4	<p>CO1 Understanding Fundamental Aspects of Vibrations: Vibration, main causes, advantages and disadvantages; engineering applications of vibration and noise; vector method of representing harmonic motion; characteristics of vibration, harmonic analysis and beats phenomenon</p> <p>CO2 Understanding Damped Free Vibrations: Viscous damping: coefficient of damping; damping ratio; under damped, over damped and critically damped systems</p> <p>CO3 Understanding Harmonically excited Vibration</p> <p>CO4 Understanding Systems With Two Degrees of Freedom</p> <p>CO5 Understanding the Noise Engineering</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester</p>
	AEL0706 Automotive Design and		<p>CO1 Understanding the Engineering materials , fit and tolerance , limit notch sensitivity design of pushrod</p>

	<p>Assembly drawing (7th semester)</p> <p>Credits (3-1-2)5</p>	<p>CO2Understanding the t design of cylinder, piston and connecting rod and their material</p> <p>CO3Understanding balancing of IC Engine, design of crankshaft.</p> <p>CO4Understanding Determination of the mass of a flywheel for a given co- efficient of speed fluctuation</p> <p>CO5Understanding assembly Drawing of engine component chassis or master assembly</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p>
	<p>AEL0707 Automotive Electrical and Electronic (7th semester)</p> <p>Credits (3-1-2)5</p>	<p>CO1 to provide study of types of battery used in automotive vehicle , rating maintenance and charging technique</p> <p>CO2Understanding types of generator i.e AC or DC, their component, alternator and starter motor.</p> <p>CO3to study of battery coil ignition system and magnetic ignition system their circuit. Spark plug and their construction.</p> <p>CO4Understanding electrical and electronic ignition system used in automotive.</p> <p>CO5Understanding Automotive wiring, types of earthling. Light used in automotive and sensors used in vehicle for measuring different types of parameters.</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p>
	<p>AEE0701 Automotive Maintenance, service and repair (7th semester)</p> <p>Credits (3-1-0)4</p>	<p>CO1Understanding types of maintenance and traffic rules of motor vehicle driving , records logs and other form</p> <p>CO2Understanding Dismantling of engine components and cleaning methods and tune up</p> <p>CO3 Understanding chassis maintenance, repair and overhaul. Wheel alignment adjustment</p> <p>CO4Understanding Testing methods for checking electrical and electronic components,</p> <p>CO5Understanding to Servicing and maintenance of fuel system of different types of vehicles, 3 Theory period of Fifty minutes per week over a semester</p> <p>1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p>

		AEE0702 Finite element method (7th semester) Credits (3-1-0)4	CO1 Understanding Introduction of FEM and their types , past methods . Advantages and applications of FEA, Steps in FEA. CO2Understanding Structural Analysis and Thermal Analysis CO3Understanding meshing , 1D, 2D,3D meshing, rules of meshing , element behavior CO4 Understanding Variation approach, principle of stationary potential energy, Rayleigh –Ritz method. Weighted Residual method, Galerikin method. CO5Understanding to Result Interpretation & Verification of FEA results 3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester
	Elective 2	Vehicle Emission and Control AEE0704 (7th semester) Credits (3-1-0)4	CO1Understanding Vehicle population assessment in metropolitan cities and contribution to pollution CO2Understanding Pollutant formation in Engines, mechanism of HC and CO formation in four stroke and two stroke engines CO3Understanding Design strategies to control emission from engines, optimum selection of operating variables for control of emissions, EGR, CO4Understanding Noise, Vibration And Harshness, Sources of Noise, Measurement of noise CO5Understanding NDIR,FID, Chemiluminescent analyzers, Gas Chromatograph, smoke meters, emission standards, driving cycles 3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester
	Hons. Elective	AEH0712 Industrial Robotics 7th semester)	CO1Understanding Need and importance, basic concepts, structure and classification of industrial robots CO2Understanding Drive systems for robots, salient features and comparison, different types of end effectors, design, applications CO3Understanding to Sensor evaluation and selection CO4Understanding Teaching of robots, manual, walk through, teach pendant, off line programming concepts and languages, applications CO5Understanding Work cycle time analysis, economics and effectiveness of robots, safety systems and devices, concepts of testing methods and acceptance rule for industrial robots 3 Theory period of Fifty minutes per week over a semester

		Credits (3-1-0)4	1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester
Hons. Elective	AEH0715 Modeling and simulation (7th semester)	Credits (3-0-0)3	CO1 Understanding Principles of Computer Modeling And Simulation CO2 Understanding Discrete Event Simulation and statical models in simulation CO3 Understanding random number generation and random variable in simulation CO4 Understanding Empirical Discrete Distribution CO5 Understanding to Design and Evaluation of Simulation Experiments and simulation software 3 Theory period of Fifty minutes per week over a semester
Course outcome	AEL0808 Production process for automotive components (8th semester)	Credits (3-1-2)5	CO1 Understanding powder metallurgy and raw production, testing and inspection of pm parts CO2 Understanding Forging – process flow chart, forging of valves and Hydro forming CO3 Understanding Different methods of gear manufacture – Gear hobbing and gear shaping machines specifications CO4 Understanding Concept & programming of CNC machines CO5 Understanding to Recent trends in manufacturing of auto components 3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester
	AEL0809 Automotive air conditioning (8th semester)	Credits (3-1-2)5	CO1 understanding air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes CO2 Understanding Basic air conditioning system, Location of air conditioning components in a car - Schematic layout of a refrigeration system CO3 Understanding Automotive heaters - Manually controlled air conditioner - Heater system - Ford automatically controlled air conditioner and heater system CO4 Understanding Air routing & temperature control CO5 Understanding Air conditioner maintenance and service, Trouble shooting of air controlling system - Compressor service. 3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester

Elective 3	AEE0807 Tractor & Form Equipments (8th semester)	<p>CO1 Understanding Fundamental of Soils and machinery; different equipments, purposes and operations; Systems of Earth Moving Equipments</p> <p>CO2 Understanding Types of reductions, Structure and function suspensions like hydraulic suspension; brakes and steering:-</p> <p>CO3 Understanding Earth moving equipments; maintenance; type of maintenance schedules; purpose and advantages</p> <p>CO4 Understanding Calculations of Operating capacity; estimating owning and operating cost; calculation of productivity of bulldozer shovel, wheel Landers and dump truck</p> <p>CO5 Understanding Safety Methods and attachment for earth moving equipments</p> <p>Credits (3-1-2)5</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p>
# Elective 3	AEE0808 Reliability (8th semester)	<p>CO1 Understanding Probability distributions used in maintenance</p> <p>CO2 Understanding System reliability n-component series systems, m-component parallel systems and combined system;</p> <p>CO3 Understanding Introduction, maintenance functions and objectives, maintenance planning and scheduling, maintenance organization</p> <p>CO4 Understanding Principles of CBM, pillars of condition monitoring, CBM implementation and benefits;</p> <p>CO5 Understanding Concept, methodology, benefits. Evolution of TPM, TPM objectives, concept, pillars of TPM.</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester</p> <p>Credits (3-1-0)4</p>
Elective 3	AEE0809 Vehicle safety (8th semester)	<p>CO1 Understanding Saloon, Convertibles, Limousine, Estate Van, racing and sports car - Driver's seat, Body Mechanisms</p> <p>CO2 Understanding Vehicle drag and types - various types of forces and moments -Effects of forces and moments</p> <p>CO3 Understanding Mini bus, single and double decker, two levels, split level and articulated bus. Bus body layout - Floor height</p> <p>CO4 Understanding Flat platform, drop side, fixed side, tipper body, tanker body.</p> <p>CO5 Understanding Body Materials, Trim and Mechanisms</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester 2 Practical period of Fifty minutes per week over a semester</p> <p>Credits (3-1-0)4</p>
Elective 4	AEE0810	<p>CO1 Understanding Alternate fuels and renewable sources of energy in automobile field -availabilities, Storage, Handling and Safety</p>

		<p>Alternative Fuels and Emission control (8th semester)</p> <p>aspects- Costs and other factors. CO2 Understanding Alcohols-CNG-LPG vegetable oils- Hydrogen and Biogas properties performance and Emission characteristics. CO3 Understanding Introduction about the solar energy collectors- Concentrating, Flat plate collectors- application wind energy-Bio energy CO4 Understanding Sources from SI and CI Engines, Two Stroke (SI and CI) engine pollution formation; Indian Emission Standards for SI and CI engines CO5 Understanding Optimization of operating factor- EGR Fumigation- Air injection-PCV system (opens Closed) Catalytic Converters-Catalyst use of unleaded petrol. Gas Analyzers-Different Smoke meters-Different test methods</p> <p>Credits (3-1-0)4</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester</p>
Elective 4	<p>AEE0811 Intelligent transportation system (8th semester)</p> <p>Credits (3-1-0)4</p>	<p>CO1 Understanding Microprocessor architecture, open and closed loop control strategies, PID control, CO2 Understanding Inductive, Hall effect, hot wire, thermostat, piezo electric, piezo resistive, based sensors. Throttle position, air mass flow, crank shaft position CO3 Understanding Three way catalytic converter, conversion efficiency versus lambda. Layout and working of SI engine management systems like Bosch L-Jetronic and LH-Jetronic CO4 Understanding Fuel injection system parameters affecting combustion, noise and emissions in CI engines CO5 Understanding ABS system, its need, layout and working. Electronic control of suspension – Damping control, Electric power steering</p> <p>3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester</p>
Elective 4	<p>AEE0812 Automotive Vehicle Dynamics (8th semester)</p>	<p>CO1 Understanding Vehicle Dynamics: Definition by SAE, vehicle control loop, mathematical modeling methods CO2 Understanding Tires construction; physics of tire; traction on dry and wet surfaces CO3 Understanding Characteristics of road vehicle; steering geometry, steady state handling characteristics CO4 Understanding Human response to vibration, vehicle ride models, road surface profile as a random function CO5 Understanding Stability & handling, vehicle motion ride control, various vehicle models</p>

		Credits (3-1-0)4	3 Theory period of Fifty minutes per week over a semester 1 Tutorial period of Fifty minutes per week over a semester
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