

AUTOMOBILE ENGINEERING

Course Code		15 AU32 - MATERIAL SCIENCE AND METALLURGY
CO1	Explain different types of material crystal structures and arrangement of atoms.	
CO2	Describe various mechanical properties of materials.	
CO3	Describe about different types of fractures and their importance in engineering applications.	
CO4	Explain the concept of equilibrium diagram.	
CO5	Plot cooling curves and phase diagrams for pure metals and alloys.	
CO6	Draw and Interpret TTT curves and Iron carbon diagram.	
CO7	Explain various heat treatment processes and their importance in engineering field.	
CO8	Identify various ferrous metals and alloys based on composition and properties for prescribed application.	
CO9	Select various nonferrous metals and alloys based on composition and properties for given application.	
Course Code		15AU33 - ENGINEERING THERMODYNAMICS
CO1	Define and explain fundamental thermodynamic laws and concepts, work, various types of works and heat and its applications, entropy and its relations	
CO2	Explain Zeroth, First & Second law of thermodynamics and its applications.	
CO3	Explain various thermodynamic relations, constants of gas and basics of ideal gas & its mixtures.	
CO4	Calculate load and IHP, BHP of IC engines.	
CO5	Explain the selection of air conditioning system; evaluate thermal performance of refrigeration cycles.	
CO6	Calculate efficiency and MEP of various gas power & vapor power cycles.	
CO7	Explain the principles of gas turbine & jet propulsion system and their fuels.	
CO8	Design cost effective thermodynamic systems	
Course Code		15AU34 - MECHANICS OF MATERIALS
CO1	Explain the significance of mechanical measurements and components of a generalized measurement system.	
CO2	Classify and explain principles of various types of transducers, modifying devices and terminating devices.	
CO3	Explain the working principle of instruments used for measurement of Force, Torque, Pressure, Temperature, Strain and Vibration.	
CO4	Explain the objectives of metrology and explain various standards of length such as line and end standards.	
CO5	Demonstrate the skills of interpreting various types of limits, fits and tolerances.	
CO6	Classify the comparators and explain their working principles.	
CO7	Explain the usage of instruments used for the measurement of screw thread and gear parameters.	
Course Code		15AU35 - MECHANICAL MEASUREMENTS AND METROLOGY
CO1	Explain the significance of mechanical measurements and components of a generalized measurement system.	
CO2	Classify and explain principles of various types of transducers, modifying devices and terminating devices.	
CO3	Explain the working principle of instruments used for measurement of Force, Torque, Pressure, Temperature, Strain and Vibration.	
CO4	Explain the objectives of metrology and explain various standards of length such as line and end standards.	
CO5	Demonstrate the skills of interpreting various types of limits, fits and tolerances.	
CO6	Classify the comparators and explain their working principles.	
CO7	Explain the usage of instruments used for the measurement of screw thread and gear parameters.	

Course Code	15AU36 - MANUFACTURING PROCESS – I
CO1	Define various terminologies used in casting process.
CO2	Explain basic concepts used in construction of various moulds.
CO3	Analyze the working of various moulding machines.
CO4	Select the appropriate moulding machine and moulding process depending on the type of raw material required to produce the desired product.
CO5	Select the appropriate joining process depending on the type of joint required to produce the desired product.
CO6	Realize the significance of Non-Destructive Testing's (NDT's).
Course Code	15AUL37 - METALLOGRAPHY AND MATERIAL TESTING LABORATORY
CO1	Apply the knowledge of Material Science and Mechanics of Materials to demonstrate the conduct of experiments in Metallography and Material Testing Laboratory
CO2	Explain the working principle of all the laboratory equipment
CO3	Explain the standard test procedures
CO4	Plot graphs (if any) and interpret the results.
CO5	Explain the significance of the various tests conducted in practice, research works etc.
Course Code	15AUL38 - FOUNDRY AND FORGING LABORATORY
CO1	Apply the basic knowledge of Foundry and Forging to demonstrate the conduct of experiments in Foundry and Forging Laboratory.
CO2	Explain the working principle of all the laboratory equipment and accessories/tools
CO3	Explain the standard test procedures
CO4	Plot graphs (if any) and interpret the results.
CO5	Explain the significance of the various tests conducted in practice, research works etc.
Course Code	15AU42- FLUID MECHANICS
CO1	Define fluid properties and distinguish between types of fluids.
CO2	Describe Pascal's law, Hydrostatic law & their application to solve engineering static fluid problems.
CO3	Explain the concepts of Buoyancy and stability of floating objects.
CO4	Explain the kinematics of fluid like types of flows, application of continuity equations.
CO5	Explain the forces acting when fluid is under motion & application of Bernoulli's equation for solving flow problems.
CO6	Explain the different methods of measurement of flows.
CO7	Analyze dimensional analysis methods and its applications to engineering problems.
CO8	Explain and estimate the various types of losses occurring when fluid is flowing through the pipes.
CO9	Explain the concepts of laminar flow & viscous flow through the pipe and plates.
CO10	Analyze various forces acting on submerged bodies in engineering flow problems
Course Code	15AU43- KINEMATICS OF MACHINES
CO1	Define and explain the terms such as Link, Kinematic chain, Kinematic pair, types of pairs, degree freedom, Mechanism, Machine Mobility.
CO2	Sketch and explain various types of mechanisms, and their inversions.
CO3	Draw Velocity and Acceleration of simple mechanisms using Instantaneous centre method, Analytical and Graphical methods.
CO4	Explain the Gear terminology, Law of gearing, gear tooth systems
CO5	Determine the velocity ratio of different types of gear trains using tabular and algebraic methods
CO6	To draw cam profile and calculate the velocity and acceleration of cams at any given instant.
Course Code	15AU44 - AUTOMOTIVE ENGINE
CO1	Explain the constructional details of SI and CI engines and classify engines
CO2	Explain the construction and working of carburetors and fuel injection pumps
CO3	Explain the combustion process in SI and CI engines

CO4	Suggest an efficient cooling system for IC engines
CO5	Suggest a proper lubricant to be used in an automobile used in various environmental conditions
Course Code	15AU45 - COMPUTER AIDED MACHINE DRAWING
CO1	Use the Solid Edge software for drawing and solid modelling.
CO2	Sketch the solutions of the sections of solids, determine the inclination of the cutting plane when true shape of section of an object is given.
CO3	Sketch and draw the orthographic views of simple machine parts (top view, front view, side view) using first angle projection.
CO4	Sketch and draw the sectional views of simple machine parts.
CO5	Sketch and draw ISO metric threads, Square, ACME & BSW forms of threads using conventional representation.
CO6	Distinguish between temporary and permanent joints and sketch and draw the different types of keys.
CO7	Sketch and draw two views of different types of riveted joints
CO8	Sketch and draw two views of different automotive components, couplings and joints
CO9	Create solid models of different parts and assemble them and draw their sectional views using Solid Edge software.
CO10	Prepare assembly drawings along with their bill of material.
Course Code	15AU46 - MANUFACTURINGPROCESS –II
CO1	Define various terminologies used in production technology.
CO2	Explain basic concepts used in construction of various machine tools.
CO3	Analyze the various mechanisms underlying the working of various machine tools.
CO4	Select the appropriate machining process depending on the properties of the raw material required to produce the desired product.
CO5	Realize the significance of non-traditional machining.
CO6	Realize the significance of technological advances in the field of automating manufacturing engineering activities.
Course Code	15AUL47 - MECHANICAL MEASUREMENTS AND METROLOGY LABORATORY
CO1	Identify the measuring instruments, explain their parts and demonstrate its usage
CO2	Calibrate pressure sensor, thermocouple, LVDT, load cell.
CO3	Demonstrate the determination of modulus of elasticity of MS specimen experimentally using strain gauges.
CO4	Demonstrate the usage of slip gauges for the calibration of micrometer, verniercaliper, height gauge.
CO5	Determine the unknown angle using sine bars, bevel protractor
CO6	Demonstrate the measurement of cylindricity and circularity of given components.
CO7	Measure thread parameters using three wire/two wire methods and gear parameters using gear tooth Vernier.
CO8	Demonstrate the usage of tally surf to measure the surface rough parameters of a machined component.
Course Code	15AUL48 - MACHINE SHOP
CO1	Apply the basic concepts/knowledge of machine tools gained through the course
CO2	“Manufacturing Process-II” to prepare the models listed below.
CO3	Demonstrate the knowledge and the skills required with respect to the operation of machine tools, carry out various machining operations.
Course Code	15AU51 - MANAGEMENT AND ENTREPRENEURSHIP
CO1	Explain management functions of a manager. Also explain planning and decision-making processes.
CO2	Explain the organizational structure, staffing and leadership processes.
CO3	Describe the understanding of motivation and different control systems in management.

CO4	Understanding of Entrepreneurships and Entrepreneurship development process.
CO5	Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur.
CO6	Summarize the preparation of project report, need significance of report. Also, to explain about industrial ownership.
Course Code	15AU52 - DYNAMICS OF MACHINES
CO1	Calculate static forces at various points in different types of mechanism.
CO2	Calculate fluctuation of energy in flywheel and dimensions of flywheel.
CO3	Balance rotating masses and of reciprocating masses in internal combustion engine, V-engine, radial engine and to solve analytically and graphically to balance the systems.
CO4	Calculate gyroscopic effect on stability of vehicles, ship, aircraft etc.
CO5	Analyze effect of profile of cam on motion of followers
Course Code	15AU53 - DESIGN OF MACHINE ELEMENTS - I.
CO1	Explain the importance of Standards in Design, Selection of materials as per CODES & STANDARDS.
CO2	Analyze the various modes of failure of machine components under different static load conditions and use appropriate theories of failures to design machine components.
CO3	Compute the dimensions of simple machine components.
CO4	Design shafts for transmission of power under various conditions.
CO5	Design of welded joints, riveted joints and power screws
Course Code	15AU54 - AUTOMOTIVE FUELS AND COMBUSTION
CO1	Explain available energy sources for internal combustion engine.
CO2	Determine A/F ratio for a given fuel.
CO3	Explain stages of combustion in S.I. & C.I. engines.
CO4	Design SI& CI engine combustion chambers.
CO5	Explain and differentiate between multi fuel and duel fuel engines.
Course Code	15AU554 - HYDRAULICS AND PNEUMATICS
CO1	Describe various components of hydraulic system and maintenance of hydraulic system.
CO2	Design hydraulic system.
CO3	Describe layout and details of pneumatic systems.
Course Code	15AU563 -NON-TRADITIONAL MACHINING
CO1	Discuss the difference between conventional and non-conventional machining process
CO2	Characterize the USM and AJM with the effect of parameters and process characteristics
CO3	Explain the working principle ECM and CHM with the effect of parameters and process characteristics
CO4	Discuss about the working principle of EDM with the effect of parameters and process characteristics
CO5	Describe the working principle PAM and LBM with the effect of parameters and process characteristics
Course Code	15AUL57 - AUTOMOTIVE ENGINE COMPONENTS LAB
CO1	Write technical specifications of different types of engines.
CO2	Dismantle and assemble the S. I and C.I Engines and to inspect the engine parts for wear, cracks, etc.
CO3	Perform vacuum and compression test on diesel and Petrol engine.
CO4	To dismantle and assemble different units of fuel system, cooling system, lubricating system.
Course Code	15AUL58 - FLUID MECHANICS AND FUELTESTING LAB
CO1	Determine coefficient of discharge of venture meter and orifice meter.
CO2	Determine major and minor losses in flow through pipes.

CO3	Investigate performance characteristics of various fluid pumps.
CO4	Determine flash point, fire point, calorific value, viscosity, cloud point, moisture content of fuel and lubricants.
Course Code 15AU61 - AUTOMOTIVE CHASSIS & SUSPENSION	
CO1	Explain different chassis layouts and frames and solve for stability and weight distribution and suitability cross sections for frames.
CO2	Describe various Front Axles, factors of wheel alignment Steering Systems and Calculate dimensions of Front Axle.
CO3	Describe various types Propeller Shaft, Differential and Rear axles and can find dimensions of these components.
CO4	Select type of brake required to given application and will be able to calculate basic dimension of brakes.
CO5	Describe, About Various Types of Suspensions, Wheels and Tyres.
CO6	Calculate dimensions of different suspensions.
Course Code 15AU62 - HEAT AND MASS TRANSFER	
CO1	Demonstrate fundamental principles and laws of conduction, convection and radiation modes of heat transfer.
CO2	Analyze one dimensional steady state heat transfer.
CO3	Analyze one dimensional one-dimensional unsteady state heat transfer.
CO4	Analyze one dimensional forced convection heat transfer problems.
CO5	Analyze one dimensional free convection heat transfer problems.
CO6	Analyze one dimensional application like flow over flat plate etc.
CO7	Introduce basic principle of heat exchanger analysis and thermal design.
CO8	Apply laws of radiation heat transfer to solve engineering problems.
Course Code 15AU63 - DESIGN OF MACHINE ELEMENTS -II	
CO1	Design the curved beams using the equations of stress.
CO2	Design helical spring and leaf spring using the equations of stress and deflection.
CO3	Design the spur gears and helical gears using different parameters and check the gears for dynamic and wear load.
CO4	Design the various types of bevel gears and worm gears for dynamic and wear load using various parameters.
CO5	Design sliding contact and rolling contact bearings to find coefficient of friction, heat generated, heat dissipated and average life of bearings.
CO6	Analyze and design given machine components and present their designs in the form of a Report.
Course Code 15AU64 - AUTOMOTIVE TRANSMISSION	
CO1	Explain the Constructional, design and working principles of different types of clutches.
CO2	Explain the constructional and working principle of different types of fluid flywheel, torque converter and one way clutches.
CO3	Explain the constructional and working principle of different types of gear box.
CO4	Determine the gear ratio, speed of vehicle and number of teeth on driving and driven gears.
CO5	Explain the constructional and principle of operation of different types epicyclic gear box, Calculate gear ratio for epicyclic gear box
CO6	Explain the necessity and advantages of automatic transmission.
CO7	Explain the construction and principle of operation of different types of automatic transmissions and hydraulic control
Course Code 15AU653 - COMPOSITE MATERIALS	
CO1	Describe basic concepts of composite materials and application of composite materials in various engineering fields.
CO2	Describe various FRP processing.
CO3	Describe selection, requirements for production and application of MMCs.
CO4	Describe concepts of nano materials, nano technology and use of nano materials.

CO5	Use various techniques used for MMCs production.
CO6	Analyze micro mechanical properties of lamina using various approaches.
Course Code	15AU663 - NON- DESTRUCTIVE TESTING
CO1	Explain Principles of selection of NDE
CO2	Describe various inspection methods like Magnetic particle, Radiographic Inspection
CO3	Monitor, improve or control manufacturing processes.
CO4	Verify proper assembly and Inspect for in-service damage
Course Code	15AUL67 - AUTOMOTIVE CHASSIS COMPONENTS LAB
CO1	Identify the various chassis frames of cars, bus (front engine & rear engine), truck and articulated vehicles.
CO2	List specifications of different two and four wheeled vehicles.
CO3	Disassemble / assemble, clean, inspect and service chassis sub-systems like suspension, clutch / gear box, final drive / differential, brake, steering and tyres / wheels.
Course Code	15AUL68 - ENGINE TESTING AND EMISSION MEASUREMENT LABORATORY
CO1	Determination of performance characteristics of various types of engines.
CO2	Determine finding FP, IP, BP of multi Cylinder engines by conducting Morse test.
CO3	Verify suitability of various alternative fuels for internal combustion engines.
CO4	Conduct mission tests on various engines.
Course Code	15AU71 - AUTOMOTIVE ELECTRICAL AND ELECTRONIC SYSTEMS
CO1	Explain the construction of battery used in automotive vehicles.
CO2	Describe the construction and working of cranking motor, D. C. generator, alternator, ignition systems along with trouble shooting.
CO3	Discuss the faults arising in automotive wiring and lighting system.
CO4	Explain various chassis electrical systems.
CO5	Describe transducers and sensors.
CO6	Explain various aspects of electrical and Hybrid vehicles.
Course Code	15AU72 - AUTOMOTIVE ENGINE COMPONENTS DESIGN AND AUXILIARY SYSTEMS
CO1	Calculate major dimensions of engine components like cylinder, piston, connecting rod, crankshaft, valve and valve operating mechanisms.
CO2	Analyze working of two stroke engine.
CO3	Select suitable scavenging process for two stroke engine.
CO4	Select suitable lubricant and lubrication system for given engine.
CO5	Calculate amount coolant required and select suitable cooling system for given engine.
CO6	Explain need for supercharger and modifications required in engine for supercharging
Course Code	15AU73 - FINITE ELEMENT MODELING AND ANALYSIS
CO1	Describe the fundamentals of structural mechanics and finite element method.
CO2	Develop element stiffness matrix for different elements using various methods.
CO3	Illustrate different methods of deriving shape functions for various elements.
CO4	Analyze one dimensional structural and thermal problem.
Course Code	15AU743 - TRIBOLOGY
CO1	Calculate viscous force developed in oil between parallel plates.
CO2	Develop mathematical models for tribological processes
CO3	Design journal bearings.
CO4	Design hydrostatic bearings for optimal performance.

CO5	Select bearing materials
CO6	Explain different aspects of tribological properties.
Course Code	15AU751 - CONTROL ENGINEERING
CO1	Differentiate between open loop and closed loop control systems with practical examples.
CO2	Solve a complex control system to simple form using block diagrams and signal flow graph.
CO3	Evaluate the response of a control system for step & ramp inputs using differential equations.
CO4	Analyze stability of a given system by using polar, Nyquist, bode plots and root locus concepts.
CO5	Explain need for system compensations.
Course Code	15AUL76 - AUTOMOBILE SCANNING AND RE-CONDITIONING LAB
CO1	Check and adjust ignition timing and tappet clearance
CO2	Align the given connecting rod
CO3	Rebore the given engine cylinders
CO4	Service the FIP and calibrate
CO5	Repair the vehicle body and paint it
Course Code	15AUL77 - MODELING AND ANALYSIS LAB
CO1	Describe procedure for FEA
CO2	Model and analyze bar, beam and trusses subjected to various types of loads
CO3	Analyze heat transfer and flow processes