Course Description

Automotive Engineering Program Courses

03608111 Automotive Engineering Drawing 3(2-3-6)

Applied geometric constructions. Orthographic projection. Isometric drawing. Oblique drawing. Sectional view. Computer-aided-design in two dimensions for automotive engineering. Geometric dimensioning and tolerancing. Surface texture and fit. Thread and spring drawing.

03608131 Automotive Technology Exploration 3(3-0-6)

History of automotive. Terminology and unit of measurement in automotive. Category of automotive. Engines. Basic principles of automotive powertrain and chassis. Cooling and lubricant systems. Exhaust systems. Safety systems. Comfort systems. Auxiliary systems. Future trends of automotive. Automotive laws.

03608221 Automotive Engineering Materials 3(3-0-6)

Materials structure for automotive engineering. Engineering ceramics. Engineering polymers. Engineering metals. Lightweight materials. Mechanical properties. Stress. Strain. Creep. Fatigue. Fracture. Physical properties. Oxidation reaction. Corrosion. Role of automotive material and application.

03608222 Mechanics of Automotive Materials 3(3-0-6)

Forces and stresses in automotive structures. Stresses and strains relationship. Stresses in beams. Shear force and bending moment diagrams. Deflection of beams. Torsion. Buckling of columns. Deformation analysis of automotive structures. Mohr’s circle and combined stresses. Automotive Material failure criterion.

03608232 Vehicle Aerodynamics 3(3-0-6)

Characteristic flows around vehicles. Nature and stakes of aerodynamics loads on vehicles. Fluid properties. Flow classification. Kinematics. Fundamental equations of fluid flows. Integral forms of conservation laws. Dimensional analysis. Boundary layer and flow separation. Aerodynamic forces and moments. Streamlined and Bluff Body aerodynamics.

03608241 Thermodynamics for Automotive Engineering 3(3-0-6)

State change of substance. Basic heat transfer. First and second law of thermodynamics. Entropy analysis. Gaseous-working fluid power cycle. Rankin cycle. Combined power cycle. Ideal gas mixture. Psychrometric chart. Combustion for vehicles.

03608251 Automotive Electrical System 3(2-3-6)

Basic principles of electronics and power electrical engineering. Analog and digital signals. Controller area network. CAN bus. Lighting system. Starting and charging systems. Electrical engine, transmission, and hydraulic systems. Safety in automotive electrical system. Battery and energy storage of hybrid cars.

03608261 Automotive Engineering Laboratory I 1(0-3-2)

Pre-requisite : 03608221 or concurrent study or 03608241 or concurrent study

Experimental works in engineering mechanics, automotive engineering materials, mechanics of automotive materials, thermodynamics for automotive engineering, occupational health, safety and environment, and vehicle aerodynamics.

03608312 Computer-Aided Design in Automotive Engineering 3(2-3-6)

Computer-aided design in three dimensions. Curve and surface designs. Geometrical model. Bill of materials. Reverse engineering. Physical problem simulation related to automotive engineering. Automotive part design and analysis.

03608313 Automotive Part Design 3(3-0-6)

Material properties. Material failure theory. Stress and strain concentration. Safety factor. Automotive part design. Connecting design engineering. Wedges. Splices. Fly wheels. Clutches. Brakes. Bearings. Belts. Chains. Sprockets. Design for manufacturing and assembly. Reverse engineering case studies on automotive parts.

03608314 Introduction to Modern Automotive Design 3(2-3-6)

Modern automotive development. Automotive design and development process. Automotive packaging requirements, constraints and concepts. Design of major system and components in the automotive. Appearance concept and style. Body structure. Lightweight structure. Passenger compartment design. Power trains for engine, electric and motor power. Automotive system design project.

03608323 Modern Automotive Mechanics 3(3-0-6)

Traction power. Resistance forces of motion. Acceleration. Gear ratio. Gear system. Hybrid transmission. Engine performance. Vehicle stability on horizontal and inclined planes. Equations of vehicle motion. Dynamics stability. Brake deceleration.

03608333 Automotive Dynamic System and Control 3(3-0-6)

Classifications of dynamic systems. Mechanical, electrical, fluid, and thermal systems modeling. Standard models for dynamic systems. Numerical simulation of dynamic systems. Analytical solution of linear dynamic systems. System analysis using Laplace transforms. Analyses of frequency and time responses. Feedback control. Steering control. Adaptive cruise control. Electronic stability control. Active and passive automotive suspension systems.

03608334 Automotive Engineering Processes 3(3-0-6)

Automotive manufacturing industry. Materials in automotive engineering. Metal casting. Stamping and metal forming process. Automotive joining. Automotive Painting. Final assembly. Computer aided design. Ecology in automotive process. Automotive manufacturing process. Machine layout strategies in the automotive manufacturing process. Planning and production control. Quality control of automotive manufacturing processes. Production support systems.

03608342 Automotive Thermal Management System 3(3-0-6)

Conduction. Forced and free convection. Thermal radiation. Industrial and automotive heat exchangers. Boiling and condensation. Engine heat transfer. Design of workable systems. Equation fitting. Modeling and simulation of thermal equipment in automotive. Optimization techniques and applications in automotive.

03608343 Automotive Air Conditioning 3(3-0-6)

Basic knowledge of refrigeration. Refrigeration cycles. Coefficient of performance. Air properties. Basic knowledge of the automotive air conditioning. Calculation of cooling load of air conditioning systems in vehicles. Automotive air conditioning system components. Compressor. Condenser. Evaporator. Refrigerants and their properties. Air conditioning controls in the internal combustion engine vehicles and in the electric vehicles. Environmental impact from the automotive air conditioning.

03608352 Autonomous Vehicle Control 3(3-0-6)

Background in developing self-driving vehicles. Roles of control in autonomous systems. System architecture and hybrid system modeling. Principles of autonomous vehicle control systems. Actuators. Sensors. Hardware and software architectures of autonomous vehicle systems. Algorithm for decision making of autonomous vehicles. Perception and prediction of environments. Control and planning of the autonomous vehicles. Safety practices of autonomous vehicles on roads.

03608353 Visual Programming for Automotive Engineering 3(2-3-6)

Visual programming. Algorithm design. Collaborative hardware and software. Big data management and analysis. Data processing. Digital signal processing. CAN bus technology. Communications via the CAN bus protocol and OBD2.

03608362 Automotive Engineering Laboratory II 1(0-3-2)

Pre-requisite: 03608313 or concurrent study or 03608323 or concurrent study

Experimental works in modern automotive mechanics, automotive part design, automotive thermal management system, internal combustion engine, automotive air conditioning and autonomous vehicle control.

03608399 Automotive Engineering Project Preparation 1(0-3-2)

Preparation of project proposal. Literature review and progress report.

03608424 Noise, Vibration and Harshness 3(3-0-6)

Fundamentals of sound and vibration. Free and forced vibration. Multi-degree-of-freedom damped system. Natural frequency and mode shape. Powertrain and engine vibration. Vibration of suspension system. Human response to vehicle vibration. Control of vehicle vibration. Vibration measurement and analysis. Sources and analysis of vehicle noise.

03608444 Engineering Management and Economics 3(3-0-6)

Basics of capitalism. Demand and supply analysis. Project definition. Project management and environment. Investment appraisal. Stakeholder management. Project-success criteria. Organization structures. Project life cycles. Work Breakdown Structures. Estimating. Risk management. Quality management. Cash-flow forecasting. Cost control. Business case study.

03608445 Batteries for Electric Vehicles 3(3-0-6)

Basic principle of electrochemical. Types of vehicle batteries. Battery parameters. Lithium-ion batteries. Battery pack and battery management system for vehicles. Battery charging in electrical vehicles.

03608499 Automotive Engineering Project 2(0-6-3)

Pre-requisite: 03608399

Projects of practical interest in various fields of automotive engineering.

Automotive Engineering Program Extracurricular Courses

01403114 Laboratory in Fundamentals of General Chemistry 1(0-3-2)

Pre-requisite: 01403117

Laboratory in Fundamentals of General Chemistry.

01403117 Fundamentals of General Chemistry 3(3-0-6)

Atomic structure, periodic table and periodic properties, chemical bonds, stoichiometry, gases, liquids, solids, solutions, chemical kinetics, chemical equilibria, acids and bases, ionic equilibria, representative elements, metals, nonmetals and metalloids, transition metals.

01417167 Engineering Mathematics I 3(3-0-6)

Limits and continuity of functions, derivatives and applications, differentials, integration and applications, polar coordinates, improper integrals, sequences and series, mathematical induction.

01417168 Engineering Mathematics II 3(3-0-6)

Pre-requisite: 01417167

Vector and solid analytic geometry, calculus of multivariables functions, calculus of vector – valued functions.

01417267 Engineering Mathematics III 3(3-0-6)

Pre-requisite: 01417168

First order linear differential equations, linear differential equations with constant coefficients, Laplace transforms and inverse transforms, power series solutions, system of linear differential equations.

01420111 General Physics I 3(3-0-6)

Mechanics, harmonic motion, waves, fluid mechanics, thermodynamics.

01420112 General Physics II 3(3-0-6)

Pre-requisite: 01420111

Electromagnetism, electromagnetic waves, optics, introduction to modern physics and nuclear physics.

01420113 Laboratory in Physics I 1(0-3-2)

Pre-requisite: 01420111 or concurrent study or 01420117 or concurrent study

Laboratory for General Physics I or Basic Physics I.

01420114 Laboratory in Physics II 1(0-3-2)

Pre-requisite: 01420113 and 01420112 or concurrent study or 01420118 or concurrent study

Laboratory for General Physics II or Basic Physics II.

03600490 Co-operative Education 6

On the job training as a temporary employee according to the assigned project including report and presentation.

03604223 Basic Principles of Engineering Mechanics 3(3-0-6)

Pre-requisite: 01417167

Force systems and resultant. Equilibrium. Dry friction. Application of equilibrium equations to structures and machines. Fluid statics. Kinematics

and kinetics of particles and rigid bodies. Newton's laws of motion. Principles of work and energy. Impulse and momentum.

03604262 Health Safety and Environment 3(3-0-6)

Concepts of occupational health, safety and environment. Safety at work. Cause and nature of accidents and incidents. Application of engineering techniques in prevention and control of accidents and incidents. Prevention of hazardous working condition. Production process and machinery. Causes and types of fire. Fire alarm and fire protection systems. Life safety from fire. Standards and laws on occupational health. Safety and environment. Water and air pollution. Industrial waste management.

03604271 Digital Technology in Mechanical Engineering 3(2-3-6)

High-level language programming. Computer arithmetic and error analysis. Numerical methods for linear and nonlinear equations. Numerical methods for data management and analytics. Computing tools for big data analytics. Data Interpretation. Introduction to image processing for machine vision.

03604281 Workshop Practice 1(0-3-2)

Practice in work-piece measuring. Gas and arc welding. Metal sheet w Lathe works. Safety in workshop.

03604331 Internal Combustion Engines 3(3-0-6)

Pre-requisite: 03604341 or 03604202

Fundamentals of internal combustion engine. Spark-ignition and compression-ignition engines. Fuels and combustion. Ignition systems. Ideal fuel-air cycle. Supercharging and scavenging. Performance and testing. Lubrication. Engine design and operating parameters.

03604334 Safety for Motor Vehicle 3(3-0-6)

Pre-requisite: 03604223

Mechanical characteristics of pneumatic tires. Hydroplaning of pneumatic tires. Force distribution during acceleration and braking. Performance of vehicles. Energy and thermal requirement of brakes. Turning performance. Directional and stability control. Vehicle collision. Crash protection and energy absorption.

03604432 Automotive Powertrains 3(3-0-6)

Automotive powertrains components. Fuel system. Ignition system. Lubricating system. Cooling system. Principles of automotive powertrains. Modern technology of engine control system.

03604433 Automotive Chassis 3(3-0-6)

Automotive chassis components. Transmission system. Braking system. Suspension system. Steering system. Wheels and tires. Frame. Principles of automotive chassis. Modern technology of automotive chassis.

03604437 Lubrication 3(3-0-6)

Pre-requisite: 03604242

Viscosity. Lubricant. Journal bearing. Trust bearing. Reynolds equation. Hydrostatic lubrication. Hydrodynamic lubrication. Elastohydrodynamic lubrication.

03604442 Power Plant Engineering 3(3-0-6)

Pre-requisite: 03604341 or 03604202

Energy conversion principles and availability concept. Fuels and combustion analysis. Component study of steam, gas turbine and internal combustion engine power plants. Combined cycle and cogeneration. Hydro power plant. Nuclear power plant. Control and instrument. Power plant economics and environmental impacts.

03604471 Robots, Artificial Intelligence, and Internet of Things 3(3-0-6)

Overview of robotic systems. Industrial robot operations and programming. Task modeling and simulation. Operations of mobile robots and applications. Basic principles and applications of artificial intelligence. Basic artificial intelligence programming. Basic principles and applications of IoT. Communication Setup for IoT Systems.