BACHELOR OF TECHNOLOGY
AUTOMOBILE ENGINEERING
THIRD YEAR (FIFTH SEMESTER)
W.E.F. ADMISSION BATCH 2023-24

Sl. No.	Category	Course Code	Course	Contact Hrs. L-T-P	Credit	University Marks	Internal Evaluation
Subject (Theory)							
1	PC	AUPC3001	Automative Chassis	3-0-0	3	100	50
2	PC	AUPC3002	Automative Electrical and Electronics	3-0-0	3	100	50
3	PC	AUPC3003	Vehicle Body Engineering	3-0-0	3	100	50
4	PE	AUPE3001	Automotive Fuels and Lubricants	3-0-0	3	100	50
		MEPE3003	Production and Operation Management				
		AUPE3003	Computational Theory on Solid Mechanics				
		-	-				
		-	-				
		-	-				
		-	-				
5	HS	HSHS3001	Business Management	3-0-0	2	100	50
		HSHS3002	Entrepreneurship Development				
6	MC	MCMC3001	Environmental Engineering	3-0-0	2	100	50
		MCMC3002	Industrial Safety Engineering				
Subject (Sessional / Practical)							
7	PC	AUPC3201	Automative Chassis Laboratory	0-0-3	1.5	-	100
8	PC	AUPC3202	Automative Electrical and Electronics Laboratory	0-0-3	1.5	-	100
9	PC	AUPC3203	Vehicle Servicing Engineering Laboratory	0-0-3	1.5	-	100
10	PSI	AUPS3201	Seminar on SIRE - I	0-0-3	1.5	-	100
			Total	**18-0-12**	**22**	**600**	**700**

Click here to view/download the syllabus of the subjects.

AUPC3001 AUTOMOTIVE CHASSIS (3-0-0)

Course Objectives:

1. To impart knowledge on various chassis layouts and frame types used in vehicles.
2. To study the structural and functional aspects of suspension, steering, braking, wheels, and tyres.
3. To enable students to understand recent advancements in chassis systems like ABS, EBD, and active suspensions.

Module-I Introduction to Chassis and Frames (06 Hours)

Functional requirements of a chassis. Classification of vehicle chassis: front-engine rear- drive, front-engine front-drive, all-wheel-drive. Types of vehicle frames: ladder, backbone, space frame, monocoque. Materials used in chassis and frames: high strength steel, aluminium, carbon fiber composites. Load distribution and stress analysis in frames. Torsional and bending stiffness concepts.

Module-II Front Axle and Steering Systems (09 Hours)

Functions and types of front axles: dead and live axles. Stub axle types: Elliot, Reverse Elliot, Lamoine. Steering geometry: caster, camber, kingpin inclination, toe-in and toe-out. Ackermann and Davis steering mechanisms. Power steering systems: hydraulic, electro- hydraulic, electric power steering (EPS). Advanced systems: steer-by-wire, variable ratio steering. Steering gearboxes: worm and roller, rack and pinion, recirculating ball.

Module-III Suspension Systems (09 Hours)

Objectives and classification: dependent vs. independent suspension. Leaf spring, coil spring, torsion bar, and air suspension systems. MacPherson strut, multi-link suspension, trailing arm suspension. Damping mechanisms: hydraulic dampers, gas-filled shock absorbers. Anti-roll bars and suspension geometry. Active and semi-active suspension systems: Skyhook theory, magnetorheological dampers. Electronic suspension control.

Module-IV Braking Systems (09 Hours)

Principles of braking: weight transfer and stopping distance. Types of brakes: drum, disc, mechanical, hydraulic, pneumatic. Components: master cylinder, wheel cylinder, brake liners, calipers. Brake fade, brake bleeding. Anti-lock Braking System (ABS): working principle, wheel speed sensors, hydraulic modulator. Electronic Brake-force Distribution (EBD) and Brake Assist (BA). Regenerative braking in electric and hybrid vehicles.

Module-V Wheels and Tyres (07 Hours)

Wheel construction: pressed steel wheels, alloy wheels, spoke wheels. Rim types and designations, offset, and balancing. Tyre construction: cross ply and radial, tubed and tubeless tyres. Tyre materials and tread design for various terrain. Tyre specifications and markings (IS/ISO standards). Tyre maintenance: rotation, balancing, alignment, tread wear indicators. Tyre retreading and recycling.

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1: Classify chassis and frame types used in different vehicles.
CO2: Analyze the design principles and working of front axle and steering mechanisms.
CO3: Compare various suspension systems and their dynamic behavior.
CO4: Explain the functioning of conventional and advanced braking systems.
CO5: Identify types, construction, and maintenance needs of wheels and tyres.

Textbooks:

1. Kirpal Singh – Automobile Engineering Vol. I, Standard Publishers.
2. R.K. Rajput – A Textbook of Automobile Engineering, Laxmi Publications.
3. Heinz Heisler – Vehicle and Engine Technology, SAE International.

Reference Books:

1. William H. Crouse & Donald L. Anglin – Automotive Mechanics, McGraw Hill.
2. Gillespie, Thomas D. – Fundamentals of Vehicle Dynamics, SAE.
3. Heldt, P.M. – Automotive Chassis, Chilton Co.

AUPC3002 AUTOMOTIVE ELECTRICAL AND ELECTRONICS (3-0-0)

Course Objectives:

1. To impart fundamental knowledge of automotive electrical and electronic systems.
2. To explore various sensors, actuators, and vehicle control units.
3. To understand diagnostics, onboard communication protocols, and safety features in modern vehicles.

Module-I Electrical System Components (08 Hours)

Battery Systems: Lead-acid, AGM, Li-ion batteries – construction, working, charging and discharging characteristics. Charging System: Working of dynamo, alternators (AC generators), rectifiers, regulators, voltage control. Starting System: Working of starter motors, solenoids, Bendix drive mechanism, safety relay circuits. Wiring Systems: Wiring harness layout, fuses, relays, and switches. Grounding and Earthing: Importance and layouts in vehicles.

Module-II Lighting and Accessories (08 Hours)

Lighting Systems: Headlights (halogen, HID, LED, adaptive), fog lamps, tail lamps, indicators, brake and reverse lights. Interior Lighting and Illumination: Cabin lamps, dimmers, and ambient lighting. Accessories: Wipers and washers, defoggers, cigarette lighters, horns, and 12V sockets. Dashboard Instruments: Analog and digital meters, odometer, speedometer, fuel, temperature and oil gauges. Infotainment Systems: Audio systems, Bluetooth, GPS, rear camera interface, touch screen consoles.

Module-III Sensors and Actuators (09 Hours)

Introduction: Role in control systems and automation. Common Automotive Sensors:
Temperature sensors (coolant, intake air), Pressure sensors (oil, fuel rail), Oxygen sensors, knock sensors, Speed sensors (vehicle speed, wheel speed), Position sensors (throttle, camshaft, crankshaft, pedal)
Actuators:
Electromagnetic: Solenoids, fuel injectors, Electromechanical: Stepper motors, servo motors, Piezoelectric and electrohydraulic types

Module-IV Electronic Control Unit (ECU) (08 Hours)

ECU Basics: Role and types (engine, transmission, body, airbag ECUs). Architecture: Microcontroller-based structure, I/O interfaces, memory systems. Embedded System Programming: Basic logic control, lookup tables, signal conditioning.
Communication Protocols:
Controller Area Network (CAN) – structure, message format, arbitration. Local Interconnect Network (LIN) – structure and application. FlexRay and Ethernet (brief overview).
ECU Testing and Calibration: Tools and simulation environments.

Module-V Diagnostics and Safety Systems (07 Hours)

Onboard Diagnostics: OBD-I and OBD-II standards, Diagnostic Trouble Codes (DTCs), Diagnostic connectors and scan tools
Safety Systems: Airbag control systems – types, sensors, deployment logic, Tire Pressure Monitoring Systems (TPMS) – direct and indirect methods, Electronic Stability Control (ESC) – yaw, lateral acceleration, traction control
Future Trends: ISO 26262 for functional safety, ADAS integration overview

Course Outcomes:

Upon completion of this course, students will be able to:

CO1: Identify and explain the functioning of basic automotive electrical components.
CO2: Understand and analyze the functioning of lighting, wipers, infotainment, and accessory systems.
CO3: Evaluate the role of sensors and actuators in vehicle automation.
CO4: Explain the architecture of ECUs and communication protocols.
CO5: Apply knowledge of diagnostic standards and safety systems in modern vehicles.

Textbooks:

1. William Ribbens, Understanding Automotive Electronics, Elsevier.
2. Robert Bosch GmbH, Automotive Handbook, Bentley Publishers.
3. Jack Erjavec, Automotive Technology: A Systems Approach, Delmar Cengage.

Reference Books:

1. K. Ramalingam, Automobile Electrical and Electronics, Scitech.
2. James D. Halderman, Automotive Electricity and Electronics, Pearson.
3. U.K. Singh and M. Kanchan, Automotive Electrical and Electronics Systems, Pearson.

AUPC3003 VEHICLE BODY ENGINEERING (3-0-0)

Course Objectives:

1. To understand the concepts of vehicle body types, styling, ergonomics, and comfort.
2. To study materials and fabrication methods used in body construction.
3. To analyze vehicle aerodynamics and its influence on performance and fuel efficiency.
4. To gain knowledge on crashworthiness, safety norms, and NVH mitigation strategies.

Module-I **Introduction to Body Design (07 Hours)**

Classification of vehicle bodies: sedan, hatchback, SUV, MPV, coupe, convertible, pickup. Body-on-frame and monocoque (unitary) construction – features and applications. Ergonomics: driving position, visibility angles, ingress/egress, control placement. Aesthetic design and styling: concept sketches, surface development, clay modeling. Visibility and space requirements: driver and passenger visibility, luggage space. Current trends: crossover designs, modular platforms.

Module-II **Body Materials and Manufacturing (08 Hours)**

Common materials: mild steel, high strength steel (HSS), aluminum alloys, fiber-reinforced plastics (FRP), carbon fiber. Material selection criteria: strength, weight, manufacturability, corrosion resistance, cost. Sheet metal forming processes: blanking, deep drawing, hemming, hydroforming.

Joining techniques:

Mechanical: riveting, clinching, bolting. Thermal: spot welding, MIG/TIG, laser welding. Adhesive bonding: types, applications, hybrid joining.

Surface treatment: painting, e-coating, anti-corrosion layers. Smart materials: shape memory alloys, self-healing coatings.

Module-III **Aerodynamics (09 Hours)**

Importance of aerodynamics in fuel economy, performance, and stability. Fundamental forces: drag (form, skin friction, interference), lift, side force. Drag coefficient, lift coefficient – definitions and factors affecting them. Aerodynamic shapes for different vehicle classes (cars, buses, trucks). Devices for aerodynamic enhancement: spoilers, diffusers, undertrays. Wind tunnel testing: types (open jet, closed circuit), models, test instrumentation. Computational Fluid Dynamics (CFD) basics and software used (e.g., ANSYS Fluent).

Module-IV **Safety and Crashworthiness (08 Hours)**

Introduction to vehicle safety: active and passive safety systems. Crashworthiness terminology: crumple zones, intrusion resistance, load paths. Crash energy management: deformation mechanisms and reinforcements. Side, frontal, rear impact and rollover protection. Occupant protection systems: airbags, seat belts, child restraint systems. Crash test types and dummies (Hybrid III, THOR). Global safety standards and NCAP testing (Euro NCAP, GNCAP, AIS-098).

Module-V **NVH and Comfort (08 Hours)**

Sources of noise and vibration in vehicles: engine, road, wind, transmission. Noise path analysis and structure-borne vs. airborne noise. NVH countermeasures: damping materials, absorbers, insulators, active noise control. Vehicle interior acoustics: reverberation and insulation materials. Thermal comfort systems: layout and functioning of HVAC (Heating, Ventilation, and Air Conditioning). Air circulation types: fresh air vs. recirculation, multi- zone climate control. Cabin sealing and vibration damping techniques for improved comfort.

Course Outcomes:

Upon completion of the course, students will be able to:

CO1: Identify types and characteristics of vehicle bodies and apply ergonomic principles.
CO2: Explain the materials and joining techniques used in modern automotive body construction.
CO3: Analyze aerodynamic characteristics and apply principles to reduce drag.
CO4: Evaluate crashworthiness features, safety standards, and passive safety systems.
CO5: Assess NVH levels and design for comfort and thermal management.

Textbooks:

1. Powloski, J., Vehicle Body Engineering, Business Books Limited.
2. Reimpell, J., and Stoll, H., The Automotive Chassis – Volume 2: System Design, Butterworth-Heinemann.
3. Giles, J.G., Body Construction and Design, Butterworths.

Reference Books:

1. Jason C. Brown, Vehicle Aerodynamics, SAE International.
2. R.K. Rajput, Automobile Engineering, Laxmi Publications.
3. John Fenton, Handbook of Vehicle Design Analysis, SAE.

AUPE3001 AUTOMOTIVE FUELS AND LUBRICANTS (3-0-0)

Course Objectives:
1. To study the types and properties of automotive fuels and methods of fuel testing.
2. To understand the combustion process in SI and CI engines and the role of additives.
3. To explore the types, properties, and applications of lubricants in vehicles.
4. To familiarize with various alternative fuels and their influence on performance and environment.
5. To analyze the impact of fuels and lubricants on vehicle emissions and after-treatment systems.

Module-I Fuel Properties and Testing (08 Hours)
Types of automotive fuels: Gasoline, Diesel, Kerosene. Key properties: calorific value, density, volatility, sulphur content.
Performance parameters:
Octane number – significance in SI engines, knocking tendency. Cetane number – ignition delay in CI engines.
Fuel testing methods:
ASTM distillation test, Reid vapor pressure test. Flash point, fire point, pour point, cloud point. Bomb calorimeter for calorific value determination. Distillation curve and its effect on drivability.

Module-II Combustion and Additives (07 Hours)
Combustion processes in:
Spark Ignition (SI) Engines – pre-ignition, detonation. Compression Ignition (CI) Engines – knocking, delay period.
Stoichiometry, air-fuel ratio, lean and rich mixtures. Additives for gasoline: Tetraethyl lead (TEL), MTBE, ethanol blending. Additives for diesel: Cetane improvers, anti-smoke additives, cold flow improvers. Fuel stability and storage requirements.

Module-III Lubricants (09 Hours)
Classification of lubricants: Engine oils, gear oils, greases, transmission fluids. Properties: Viscosity index, pour point, cloud point, flash point, thermal stability, anti-wear characteristics. Additives in lubricants: anti-wear, anti-oxidant, detergent, dispersant. SAE and API classification of oils (SAE 10W-30, API SN). Lubrication mechanisms: boundary, hydrodynamic, and elastohydrodynamic lubrication. Application of lubricants in engines, gearboxes, and differentials. Used oil analysis and condition monitoring.

Module-IV Alternative Fuels (08 Hours)
Gaseous fuels:
Compressed Natural Gas (CNG): composition, storage, injectors. Liquefied Petroleum Gas (LPG): handling, mixing, combustion.
Liquid fuels:
Alcohols (Methanol, Ethanol): blend ratios, effects on performance. Biodiesel: feedstocks, transesterification, fuel properties, B5 to B100 grades.
Emerging fuels: Hydrogen, synthetic fuels (e-fuels), ammonia. Dual-fuel and flexible fuel vehicle systems. Comparison of engine performance, efficiency, emissions, and durability.

Module-V Emission Control and Environmental Impact (08 Hours)
Effect of fuel composition on tailpipe emissions: CO, HC, NOx, particulate matter. Influence of lubricant additives and base oil on engine-out emissions. Emission norms: Bharat Stage VI, Euro VI – fuel and lubricant compliance.
After-treatment systems:
Catalytic converters, particulate filters, SCR (Selective Catalytic Reduction). Compatibility of fuels and lubricants with emission systems.
Role of low-sulphur fuel and synthetic lubricants in emission reduction. Greenhouse gas emissions and global warming potential (GWP) of fuels.

Course Outcomes:
On successful completion of this course, students will be able to:
CO1: Analyze different fuel types and interpret their key performance parameters through standard tests.
CO2: Explain combustion characteristics and the function of fuel additives in engine performance.
CO3: Classify automotive lubricants and assess their behavior in various conditions. CO4: Evaluate the feasibility, advantages, and limitations of alternative fuels.
CO5: Examine the role of fuels and lubricants in controlling automotive emissions and their compatibility with emission control technologies.

Textbooks:

1. Ganesan, V., Internal Combustion Engines, McGraw Hill.
2. Mathur and Sharma, A Course in Internal Combustion Engines, Dhanpat Rai Publications.
3. Gupta, H.N., Fundamentals of Internal Combustion Engines, PHI.

Reference Books:

1. Bosch Automotive Handbook, Robert Bosch GmbH, Wiley.
2. Heywood, J.B., Internal Combustion Engine Fundamentals, McGraw Hill.
3. Speight, J.G., The Chemistry and Technology of Petroleum, CRC Press.

MEPE3003 PRODUCTION AND OPERATION MANAGEMENT (3-0-0)

Course Objectives:

1. To impart fundamental knowledge of production and operations functions in manufacturing and service organizations.
2. To expose students to production planning, process design, facility layout, and scheduling.
3. To equip students with inventory and quality control techniques used in operations management.
4. To understand lean, ERP, forecasting, and optimization tools for process efficiency.

Module-I Introduction to Production & Operations Management (07 Hours)

Nature, scope and objectives of POM. Evolution of production systems (craft, mass, lean production). Interface with marketing, finance, HR, R&D, and supply chain. Characteristics of manufacturing vs service operations. Role of operations manager; decision types in operations. Trends: Industry 4.0, sustainability, AI in operations. Basics of Operations Research and its application in decision-making.

Module-II Production & Operation Systems (09 Hours)

Types of production systems: job shop, batch production, mass production, continuous flow. Characteristics, advantages, and limitations of each system. Automation in production: types, role of robotics and IoT. Overview of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM). Facility location decisions: qualitative and quantitative models, break-even analysis. Capacity planning: definition, types (design, effective, actual), tools and capacity requirement planning (CRP).

Module-III Production & Operations Planning (09 Hours)

Plant layout types: product, process, cellular, fixed-position. Facility layout planning tools: block diagramming, relationship charts (REL), CRAFT. Production process planning: routing, sequencing, scheduling. Production Planning and Control (PPC): functions, phases (pre-planning, planning, control). Aggregate Production Planning (APP): objectives, strategies (chase, level, mixed). Master Production Schedule (MPS) and capacity utilization. Tools for resource allocation: linear programming (overview).

Module-IV Operations Management Processes (09 Hours)

Process selection strategies and process lifecycle. Work study:
Method study: process chart symbols, flow process charts. Time study: stopwatch method, standard time calculation.
Value engineering and value analysis: definition, procedure, benefits. Materials Requirement Planning (MRP I) and MRP II: logic and structure. TOC (Theory of Constraints) and Critical Chain Project Management (CCPM). Line balancing: objectives, heuristics, practical examples. Forecasting: types (qualitative vs quantitative), methods (moving average, exponential smoothing, regression models).

Module-V Controlling Production & Operations (09 Hours)

Inventory functions, types and classification. Inventory models: EOQ (Economic Order Quantity), reorder point, safety stock. Inventory management techniques: ABC, VED, FSN, JIT (Just-in-Time). Introduction to ERP systems and modules in production. Maintenance strategies: preventive, predictive, and breakdown maintenance. Statistical Quality Control (SQC): Control charts for variables ($\bar{X}$ and R), Control charts for attributes (p, np, c charts). Introduction to Total Quality Management (TQM), Six Sigma, and Kaizen. Principles of Lean Manufacturing and overview of SCM (Supply Chain Management).

Course Outcomes:

On successful completion of the course, students will be able to:

CO1: Describe the role and scope of operations management in manufacturing and service sectors.
CO2: Classify production systems and apply methods for facility and capacity planning.
CO3: Formulate production plans and layouts using planning techniques and decision tools.
CO4: Apply work study and forecasting techniques to improve productivity.
CO5: Use quality and inventory management tools for effective control and continuous improvement.

Textbooks:

1. Kanishka Bedi, Production and Operations Management, Oxford University Press.
2. Martand Telsang, Industrial Engineering and Production Management, S. Chand & Co.
3. Norman Gaither and G. Frazier, Operations Management, Thomson Learning.

Reference Books:

1. S.N. Chary, Production and Operations Management, Tata McGraw Hill.
2. B. Mahadevan, Operations Management – Theory and Practice, Pearson Education.
3. William Stevenson, Operations Management, McGraw Hill.

AUPE3003 COMPUTATIONAL THEORY ON SOLID MECHANICS (3-0-0)

Course Objectives:
1. To provide a comprehensive understanding of the stiffness method for analyzing structures.
2. To expose students to non-linear behavior of materials and geometric nonlinearities.
3. To apply Finite Element Methods for structural mechanics problems.
4. To use energy methods for evaluating deformation in structural members.

Module-I Stiffness Method (08 Hours)
Overview of structural analysis using stiffness method. Types of structures: trusses, beams, and plane frames. Internal forces: axial, shear, bending moment, torsion. Derivation of element stiffness matrices for: Truss element, Beam element (with bending), Plane frame element (combined bending and axial). Assembly of global stiffness matrix. Application of boundary conditions. Solving for nodal displacements and reaction forces. Examples using matrix formulation.

Module-II Special Topics in Stiffness Methods (08 Hours)
Effect of pre-strain and initial stress on structural stiffness. Temperature effects on structural deformations. Support deformation and its influence on global stiffness. Application of symmetry and anti-symmetry in structural analysis. Elastic foundation support modelling. Coupled axial and flexural behavior in members. Composite structural elements: laminated beam and frame analysis. Introduction to shear deformation theories.

Module-III Nonlinear Problems in Solid Mechanics (08 Hours)
Introduction to nonlinearity: Geometric nonlinearity (large displacements and rotations), Material nonlinearity (plasticity, creep, viscoelasticity). Linear vs. nonlinear load- displacement response. Incremental and iterative solution methods. Newton-Raphson method: basic algorithm, convergence criteria. Modified Newton-Raphson and arc-length method (overview). Case studies on beam-column buckling and elasto-plastic behaviour.

Module-IV Finite Element Method (FEM) (09 Hours)
Continuum mechanics review: Stress and strain tensors, Hooke's law for isotropic materials. Plane stress and plane strain assumptions. FEM formulation for: 1D bar element, 1D beam element, 2D Constant Strain Triangle (CST) element. Shape functions and interpolation. Element stiffness matrix derivation. Boundary conditions and assembly procedures. Compatibility and convergence requirements. Meshing and numerical integration (Gauss quadrature – brief).

Module-V Energy Methods (8 Hours)
Principle of virtual work and minimum potential energy. Derivation of equilibrium equations using energy principles. Castigliano's First and Second Theorems. Application to statically indeterminate structures. Evaluation of strain energy due to axial, bending, shear, and torsion loads. Energy-based deflection analysis. Structural optimization concepts using energy principles (brief).

Course Outcomes (COs):
On successful completion of this course, students will be able to:
CO1: Develop stiffness matrices for trusses, beams, and frames.
CO2: Analyze secondary effects and apply stiffness methods in advanced scenarios.
CO3: Solve nonlinear structural problems using numerical approaches.
CO4: Apply FEM to 1D and 2D solid mechanics problems.
CO5: Employ energy methods for deformation and force analysis in solids.

Textbooks:
1. S.S. Bhavikatti – Finite Element Analysis, New Age International
2. R.D. Cook – Concepts and Applications of Finite Element Analysis, Wiley
3. Chandrupatla and Belegundu – Introduction to Finite Elements in Engineering, Pearson

Reference Books:

1. Timoshenko & Goodier – Theory of Elasticity, McGraw Hill
2. Bathe K.J. – Finite Element Procedures, Prentice Hall
3. G.R. Liu & S.S. Quek – The Finite Element Method: A Practical Course, Butterworth- Heinemann
4. Logan, D.L. – A First Course in the Finite Element Method, Cengage Learning

HSHS3001 BUSINESS MANAGEMENT (3-0-0)

Course Objectives

By the end of this course, students will be able to:

- Understand fundamental management principles
- Learn project management techniques and its application
- Understand the financial aspects of engineering decisions
- Demonstrate leadership, communication, and team management skills
- Understand the basics of entrepreneurship and innovation management

Module-I: Management Foundations and Organizational Dynamics

Introduction to Management: Functions of Management; Evolution of management thought and its relevance to engineering; Management vs. Leadership: Key distinctions; Decision-making processes; Organizational design and structure; Team dynamics and group behaviour; Motivation theories and their application to technical teams; Organizational Communication; Cultural considerations in global business environment

Module-II: Project Management and Financial Decision Making

Project lifecycle and phases; Work breakdown structure and scheduling; Resource allocation and budgeting; Risk management in engineering projects; Quality management and control; Basic financial statements and their interpretation; Time value of money; Budgeting and cost control; Return on investment (ROI) and net present value (NPV); Funding sources for engineering projects; Cost-benefit analysis for technical decisions

Module-III: Leadership, Innovation and Entrepreneurship

Leadership styles and their effectiveness; Managing technical teams and professionals; Performance management and feedback; Recruitment and selection in engineering roles; Training and development of technical staff; Ethical leadership in engineering; Innovation management; Technology transfer and commercialization; Startup fundamentals; Intellectual property basics; Business model development

Course Outcomes

CO1: Recall fundamental management principles, organizational theories, and project management methodologies, key financial concepts used in engineering decision-making.

CO2: Explain the relationship between management functions (planning, organizing, leading, controlling) and their application.

CO3: Demonstrate project management skills and apply financial analysis techniques for decision making.

CO4: Analyse organizational behaviour patterns, team dynamics, and performance issues in engineering management contexts.

CO5: Judge ethical implications of management decisions and leadership actions in professional engineering practice.

CO6: Create integrated management solutions for solving complex business problems.

Reference Books:

1. Management Theory and Practice" by C.B. Gupta
2. Essentials of Management" by Koontz, Weihrich, and Aryasri (Indian Edition)
3. Project Management for Engineering and Technology" by N.K. Sharma
4. Financial Management: Theory and Practice" by Prasanna Chandra
5. Organizational Behaviour" by Aswathappa K.
6. Human Resource Management" by V.S.P. Rao
7. Entrepreneurship Development" by S.S. Khanka
8. Operations Management" by R. Panneerselvam

HSHS3002 ENTREPRENEURSHIP DEVELOPMENT (3-0-0)

Course Objectives –

1. To explain concept of entrepreneurship and build and understanding about business situation in which entrepreneurs act.
2. To explain classification and type of entrepreneurs and the process of entrepreneurial project development
3. To discuss the steps in venture development and new trends in entrepreneurship.
4. The more focus is given on creativity and innovation.

Module-I: (10 hours)
Entrepreneurship: Concept of entrepreneurship and intrapreneurship, Types of Entrepreneurs, Nature and Importance, Entrepreneurial Traits and Skills, Entrepreneurial Motivation and Achievement, Entrepreneurial Personality

Module-II: (08 hours)
Entrepreneurial Environment, Identification of Opportunities, Converting Business Opportunities into reality. Start-ups and business incubation, Setting up a Small Enterprise. Issues relating to location, Environmental Problems and Environmental pollution Act, Industrial Policies and Regulations

Module-III: (10 hours)
Need to know about Accounting, Working capital Management, Marketing Management, Human Resources Management, and Labour Laws. Organizational support services - Central and State Government, Incentives and Subsidies.

Module-IV: (12 hours)
Sickness of Small-Scale Industries, Causes and symptoms of sickness, cures of sickness, Role of Banks and Governments in reviving industries.

Course Outcomes
After completion of this course, students

CO1: will aware about foundation of entrepreneurship development and its theories
CO2: will identify the type of entrepreneur and the steps involved in a entrepreneurial venture.
CO3: will understand various steps involved in starting a venture and to explore marketing methods & new trends in entrepreneurship.
CO4: Think creative and innovative

Books:

1. Entrepreneurship Development and Management, Vasant Desai, HPH
2. Entrepreneurship Management, Bholanath Dutta, Excel Books
3. Entrepreneurial Development, Sangeeta Sharma, PHI
4. Entrepreneurship, Rajeev Roy, Oxford University Press

AUPC3201 AUTOMOTIVE CHASSIS LABORATORY (0-0-3)

Course Objectives:

1. To impart practical knowledge of various components and subsystems of automotive chassis.
2. To provide hands-on training in dismantling, assembling, inspecting, and testing steering, suspension, and braking systems.
3. To analyze geometrical alignment parameters affecting vehicle stability and ride comfort.

List of Experiments:

1. Study and identification of chassis layout (ladder, monocoque) and components (frame, cross members, brackets).
2. Dismantling and assembling of a front axle assembly and identification of stub axle types (Elliot, Reverse Elliot).
3. Measurement and analysis of steering geometry: camber, caster, toe-in, toe-out, and kingpin inclination using alignment gauges.
4. Dismantling and inspection of steering gearboxes: recirculating ball type and rack-and-pinion type.
5. Demonstration of Ackermann and Davis steering mechanisms – verification of theoretical paths.
6. Study and comparison of independent vs. dependent suspension systems – MacPherson strut, leaf spring, trailing arm.
7. Load vs. deflection testing of coil and leaf springs using a spring testing machine – plotting characteristics.
8. Study and inspection of hydraulic and pneumatic brake systems – brake pedal linkage, master and wheel cylinders.
9. Testing and troubleshooting of brake master cylinder and wheel cylinder – piston movement, seal leakage.
10. Brake efficiency testing using brake test rig or on-road testing with decelerometer – calculation of braking force and stopping distance.
11. Study of wheel alignment systems – toe-in/toe-out, camber, caster angle measurements using computerized alignment machine.
12. Study and identification of types of wheels (pressed steel, alloy) and tyres (bias-ply, radial, tubeless), tyre markings, tread wear indicators.

Course Outcomes (COs):

At the end of the course, the students will be able to:

CO1: Identify and describe the construction and working of various chassis systems.
CO2: Perform dismantling, assembling, and fault diagnosis of front axle, steering, suspension, and braking systems.
CO3: Evaluate steering geometry and analyze spring performance characteristics.
CO4: Demonstrate brake efficiency testing and tyre/wheel system analysis.
CO5: Operate chassis-related tools, test benches, and wheel alignment machines.

AUPC3202 AUTOMOTIVE ELECTRICAL AND ELECTRONICS LABORATORY (0-0-3)

Course Objectives:

1. To impart hands-on training in handling, testing, and troubleshooting automotive electrical and electronic systems.
2. To expose students to automotive sensors, actuators, ECU interfacing, and vehicle communication protocols.
3. To enhance diagnostic and fault analysis skills using modern tools.

List of Experiments:

1. Battery Testing: Load test, specific gravity measurement, voltage drop test, charge/discharge cycle using battery analyzer.
2. Starting System Testing: Starter motor circuit check, solenoid switch operation verification, voltage drop measurement.
3. Charging System Testing: Alternator output check under load conditions, regulator circuit function, diode test.
4. Lighting & Horn Circuit Wiring and Testing: Headlight beam alignment, horn circuit continuity, relay-based circuit design.
5. Wiper, Defogger & Indicator Circuits: Functional testing of wiper motors, rear defogger, flasher units, turn indicators.
6. Dashboard Systems: Diagnosis of digital/analog dashboard warning systems, malfunction indicator lamp (MIL) behavior.
7. Sensor Testing: Testing of throttle position sensor (TPS), engine coolant temperature sensor, MAP sensor, knock sensor, and oxygen sensor using multimeter and scan tool.
8. Actuator Testing: Solenoid valve operation, stepper motor testing, fuel injector pulse signal simulation.
9. ECU Interfacing: Using diagnostic scan tool to communicate with ECU – monitor live data, freeze frame data, and DTCs.
10. CAN & LIN Protocol Study: Identification of CAN-H/L wiring, LIN communication bus, signal observation using logic analyzer or oscilloscope.
11. OBD-II System Demonstration: Connecting scan tool, reading diagnostic trouble codes (DTC), emission readiness test.
12. Case Study on Fault Diagnosis: Simulation of real-time electrical/electronic faults and troubleshooting using multi-scanner tools and service manuals.

Course Outcomes (COs):

After completing this lab, students will be able to:

CO1: Perform testing and inspection of basic automotive electrical systems like batteries, starters, and alternators.
CO2: Demonstrate the operation of lighting, signaling, and dashboard electronic circuits.
CO3: Analyze the working of sensors and actuators used in vehicle electronic control systems.
CO4: Interface with vehicle ECUs and retrieve diagnostic data using scan tools.
CO5: Interpret CAN and LIN communication data and identify vehicle faults using OBD- II.

AUPC3203 VEHICLE SERVICING ENGINEERING LABORATORY (0-0-3)

Course Objectives:

1. To provide students with the practical knowledge of routine vehicle service, maintenance, and repairs.
2. To train students in troubleshooting, fault identification, and application of preventive maintenance procedures.
3. To develop skills for interpreting OEM manuals, using service tools, and ensuring vehicle performance and safety.

List of Experiments:

1. General Vehicle Service Procedures: Job card preparation, service documentation, safety instructions, tool and equipment identification.
2. Engine Dismantling and Assembly: Cleaning, part identification, wear inspection, torque tightening using torque wrench.
3. Clutch and Gearbox Service: Dismantling single plate clutch and manual transmission, checking clutch wear, gear engagement, and reassembly.
4. Differential and Final Drive Servicing: Dismantling, gear backlash checking, inspection of bearings and seals, reassembly.
5. Cooling System Maintenance: Radiator flushing, thermostat testing, water pump functionality check, coolant replacement.
6. Lubrication System Check: Oil filter and oil pump inspection, oil pressure test, oil grade verification.
7. Brake Maintenance: Bleeding hydraulic brake systems, checking brake pad/disc/drum condition, adjustment of brake lever and pedal.
8. Wheel Alignment and Balancing: Measuring camber, caster, toe-in using alignment machine; dynamic and static wheel balancing.
9. Tyre Maintenance: Rotation pattern, puncture repair, tread depth measurement, inflation pressure setting using digital gauges.
10. Battery Service: Electrolyte level check, charging with battery charger, load testing, battery terminal cleaning.
11. Automotive Air-conditioning System: Refrigerant pressure measurement, leak detection, gas recharging, temperature differential testing.
12. Periodic Maintenance Practice: Service based on manufacturer-specified schedule for 2-wheelers and 4-wheelers (oil change, filter replacement, general checkup).

Course Outcomes (COs):

By the end of this course, students will be able to:

CO1: Perform basic vehicle servicing tasks with safety and efficiency.
CO2: Demonstrate dismantling and reassembly of major vehicle aggregates.
CO3: Conduct inspection and servicing of cooling, lubrication, and braking systems.
CO4: Carry out diagnostic procedures for alignment, battery, and AC systems.
CO5: Apply OEM-recommended schedules for 2-wheeler and 4-wheeler periodic maintenance.