**Maulana Abul Kalam Azad University of Technology, West Bengal**
*(Formerly West Bengal University of Technology)*
**B.Voc. in** Automobile Servicing Technology (UGC)
**(Effective for Academic Session 2024-2025)**

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**Year - 2 Advanced Diploma (SEMESTER - III)**

**Paper Title: UAMV – 301: CAD**

**Job Role: Automobile Senior Technician**

## Course Objectives

- To develop fundamental skills in 2D drafting using basic and advanced AutoCAD commands.
- To familiarize students with orthographic projections and 3D surface modeling techniques.
- To introduce students to 3D solid modeling of mechanical components using CAD tools.
- To enable modeling of mechanical assemblies like pistons, shafts, gears, and cam followers in 3D.

## Course Outcomes

CO 1: Create accurate 2D engineering drawings using various drawing and modification tools in AutoCAD.

CO 2: Generate orthographic views and 3D surface models using appropriate viewport and surface commands.

CO 3: Design and develop 3D solid models of industrial parts such as joints, pulleys, and bearings.

CO 4: Construct 3D models of engine components and simple mechanical assemblies with CAD software.

**Maulana Abul Kalam Azad University of Technology, West Bengal**

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**B.Voc. in** Automobile Servicing Technology (UGC)

**(Effective for Academic Session 2024-2025)**

| **Course Code:** | **UAMV – 301** | |
|---|---|---|
| **Course:** | **CAD** | **Credits: 3L+1T** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | Start a New Drawing, Name the Drawing Sheet, Set the Drawing Units, Drawing Precision, Drawing Limits, Grid, Snap and Draw the Margin and Title Block as given in Exercise Problems Sheet. Redraw the 2D Figures including dimensions as given in Exercise Problems Sheet using various Fundamental of 2D commands in Draw and Modify Toolbars Redraw the 2D Figures including dimensions as given in Exercise Problems Sheet using various Advance commands in Osnap, Grip, Block, Layers, Attributes, Edit Toolbars | **13** |
| **Unit-II** | Draw Front, Top, and Right Side Orthogonal view of each of the objects in given Exercise Problems Sheet using View Port commands Draw 3D Surface Models of the Objects as given in Exercise Problems Sheet, using fundamental of 3D Drawing and Surface commands | **15** |
| **Unit-III** | Draw 3D Solid Models of the Objects as given in Exercise Problems Sheet, using fundamental of 3D Drawing and Solid commands Draw 3D Models of different types of Joints, Pulleys and Engine Bearings as given in Exercise Problems Sheet. | **17** |
| **Unit-IV** | Draw 3D Models of different types of Engine Piston, Connecting Shafts and Crank Shafts as given in Exercise Problems Sheet. Draw 3D Models of Simple Automobile Assemblies of Gears & Cam Followers as given in Exercise Problems Sheet. | **15** |
| | **Total:** | **60** |

**Books Recommended:**


- AutoCAD For Dummies, Bill Fane
- Introduction To AutoCAD 2005 2D and 3D Design, Alf Yarwood
- Engineering AutoCAD, Pradeep Jain & A.P. Gautam, Khanna Publishing House
- Engineering Graphics and Design, Pradeep Jain & A.P. Gautam, Khanna Publishing House

**Paper Title: UAMV – 391 CAD LAB**

**Credit: 2P (Allotted Hours: 60)**

**List of Experiments: (Based on UAMV – 301)**

- Develop the concept of drawing of various dimensions including 2d commands.
- Draw margin and title block on drawing sheet
- Learn and apply the concept of toolbars redraw the 2d figures using Advanced commands in Osnap, Grip, Block, Layers, Attributes, edit toolbars.
- Develop the concept of Front, Top and Right side Orthogonal view and apply the same using view port commands.
- Orthographic projection drawing of a simple machine parts
- Learn and apply the concept of 3d drawings, surface commands and 3D solid model modification.
- Learn to draw the 3d models of different types viz. joints, pulleys and engine bearings.
- Learn to draw the 3d models of different types (Piston, Shafts, Automobile Assemblies, Cm Followers)
- Learn to draw 3D gear models, using array and extrude
- Power point Presentation. (Selected topics).
- Paper Presentation. (Selected topics).
- Construct crankshaft using solid modeling command
- Understand the concept of assembly drawing
- Learn to assemble 3D models of part in CAD
- Prepare bill of materials and annotate drawing correctly

**Paper Title: UAMV - 302 - DIESEL ENGINE**

**Job Role: Automobile Senior Technician**

**Course Objectives**

- To understand the construction, working, and fuel-air cycle analysis of diesel engines.
- To learn the components and working of different diesel fuel injection systems and their performance characteristics.
- To analyze air motion, combustion process, and design of combustion chambers in CI engines.
- To study supercharging, turbocharging techniques and evaluate diesel engine testing, performance, and emissions.

**Course Outcomes**

CO 1: Explain the construction and operation of two-stroke and four-stroke diesel engines and analyze diesel cycles.

CO 2: Describe various fuel injection systems, their components, nozzle types, and calibration techniques.

CO 3: Understand the air motion, combustion stages, and chamber designs for effective fuel-air mixing and reduced knock.

CO 4: Evaluate the impact of supercharging/turbocharging and analyze diesel engine testing, performance, and emissions compliance.

| **Course Code:** | **UAMV – 302** | |
|---|---|---|
| **Course:** | **DIESEL ENGINE** | **Credits: 3L+1T** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | BASIC THEORY: Diesel engine construction and operation, two stroke and four stroke diesel dual cycle engines, diesel cycle, fuel - air and actual cycle analysis, diesel fuel, ignition quality, certain number, laboratory tests for diesel fuels, standards and specifications. | **13** |
| **Unit-II** | FUEL INJECTION SYSTEM: Requirements, air and solid injection, functions of components, jerk and distributor type pumps common rail system, PTFI system pressure waves, injection lag, unit injector, mechanical and pneumatic governors, fuel injector, types of injection nozzle, nozzle tests, spray characteristics, injection timing, pump calibration. | **17** |
| **Unit-III** | AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS Importance of air motion, swirl, squish and turbulence, swirl ratio, fuel air mixing, stages of combustion, delay period, factors affecting delay period, knock in CI engines. Combustion chamber: design requirements, direct and indirect injection combustion chambers, M type combustion chamber. | **17** |
| **Unit-IV** | SUPERCHARGING AND TURBOCHARGING Necessity and limitations, types of supercharging and turbo charging, relative merits, matching of turbocharger, exhaust gas recirculation, charge cooling. DIESEL ENGINE TESTING AND PERFORMANCE Automotive and stationary diesel engine testing and related emission standards. Engine performance and emission characteristics, variables affecting engine performance and emission, methods to improve engine performance, heat balance, performance maps | **13** |
| | **Total:** | **60** |

**Books Recommended:**


- Ganesan. V “Internal Combustion Engines”, Tata McGraw - Hill Publishing Co. , New Delhi, 2003.
- Modern Diesel Technology 2nd Edition, Sean Bennett.

**Paper Title: UAMV – 392 DIESEL ENGINE LAB**

**Credit: 3P (Allotted Hours: 90)**

**List of Experiments: (Based on UAMV – 302)**

- Operation of four stroke Diesel Engine.
- Cooling system performance (cooling circulation, radiator efficiency)
- Principle of operation of single element, multi elements and distributor type FIP.
- Lubrication system in diesel engine (oil pump, filter, gallery)
- Checking and servicing of different types of injectors
- Study and observing CRDI system (working & components)
- Principle of operation of different types of Governor unit.
- Demonstration of diesel engine dismantling & reassembling)
- Fuel injection timining
- Study of turbocharger in a diesel engine
- Engine overhauling, use of compression pressure testing gauge, checking of engine noise by stethoscope.
- Engine valve servicing and valve timing adjustment
- Construction of cylinder head, combustion chamber, shape of piston head.
- Engine governor observation
- Forced induction, Types of force induction, turbo log etc
- Troubleshooting of black, blue & white smoke problem
- Use of EGR. PCV valve, catalytic converter and waste gate valve
- Troubleshooting of starting problem in diesel engine

**Paper Title: UAMV – 303: AUTOMOBILE BODY & CHASSIS ENGINEERING**

**Job Role: Automobile Senior Technician**

## Course Objectives

- Understand the structure, types, and functions of chassis frames and various automobile bodies.
- Learn the principles, types, and components of steering systems, including steering geometry and common defects.
- Study braking systems, their types, operation, and maintenance, along with suspension system requirements and components.
- Explore seat, door, and window mechanisms, as well as automobile painting methods, materials, and common failure causes.

## Course Outcomes

CO 1: Explain different chassis types, loads, and body requirements for various vehicles.

CO 2: Identify various steering systems, describe their operation, and diagnose steering defects.

CO 3: Differentiate braking systems and suspension types; describe their working and maintenance procedures.

CO 4: Demonstrate knowledge of seat, door, and window mechanisms and understand automobile painting processes and causes of paint failures.

| **Course Code:** | **UAMV – 303** | |
|---|---|---|
| **Course:** | **AUTOMOBILE BODY & CHASSIS ENGINEERING** | **Credits: 3L+1T** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | **Chassis, Frame and Body**: Introduction of Chassis frame, Layout of the Chassis and its main components, Functions of the Chassis frame, Types of Chassis frames, Various loads acting on the frame, State the different bodies used in automobiles, Explain the requirements of bodies for various types of vehicles viz. private, commercial etc.<br>**Steering System**: Requirement of the vehicle steering System, Types of steering gearboxes, Types of Steering Systems and Power Steering, Steering linkages, Under steering, over steering, & Turning radius, Ackerman's & Davis Steering gear Mechanism, Steering geometry - Caster, Camber, King pin inclination, toe in and toe out, Wheel alignment, Steering defects - wheel wobble and shimmy, List out the type of steering system used in various vehicles. | **13** |
| **Unit-II** | **Braking System:** Explain Functions of brakes, Requirements of automobile brakes, Explain stopping time and stopping distance, Types of Braking systems - Disc and Drum braking system, Construction and working of Mechanical, hydraulic, and air brakes, - Bleeding of brakes in Hydraulic brakes, List out the types of brakes used in various vehicles.<br>**Suspension System**: Requirements of a automobile suspension system, Types of suspension system - conventional and Independent, Types of springs - Laminated spring, coil spring, helical spring, Need of Shock absorber - construction and working of different types of shock absorbers, Stabilizer bar and torsion bar, List out the type of suspension system used in various vehicles | **17** |
| **Unit-III** | **Seat, Door and Window mechanism**: Construction and working of door lock mechanism, Construction and working of manual window regulating mechanism, Construction and working of power window regulating mechanism, Construction and working of seat adjusting mechanism. | **17** |
| **Unit-IV** | **Painting of automobiles**: Constituents of paints, Methods of painting, Painting Procedure, Reasons for failure of paint. | **13** |
| | **Total:** | **60** |

**Books Recommended:**


- John Doke “Fleet Management”, McGraw - Hill Co. 1984.
- Babu, A.K., Automobile Mechanics, Khanna Publishing House, 2018

**Paper Title: UAMV – 393 AUTOMOBILE BODY & CHASSIS ENGINEERING LAB**

**Credit: 3P (Allotted Hours: 90)**

**List of Experiments**: (**Based on UAMV – 303)**

- Construction and operating principle of chassis body and frame. Different types of chassis body shape, one box, two boxand three box.
- Demonstration of bonnet, boot lid & hinge mechanism, windshield wiper, washer, central locking system & sliding door mechanism
- Different components / linkage use in steering system. Working principle and construction of different types of steeringgear box and power steering system. Steering geometry caster camber and toe-in adjustment.
- Construction and operation of different types of brake system employed in the automobile. Adjustment of drum and discbrake. Bleeding of hydrolic brake system. Use of ABS, EBD and TCS
- Construction and working principle of various suspension system use in automobile. Construction and operation of leafspring, coil spring air spring, rubber spring, torsion bar, shock absorber and stabilizer bar
- Name the various parts of mono construction body. Construction and working principle of door lock mechanism, manualand power window regulator mechanism.
- Study of different chassis layout-ladder frame, space frame, monocoque
- Demonstration of power steering system
- Dismantling and studying drum brake assembly
- Dismantling and studying disc brake assembly
- Study of parking brakes
- Comparative study with observation of independent and rigid axle suspension
- Demonstration of MacPherson strut suspension system
- Multi-link suspension used in modern cars

**Paper Title: UGEN – 381: VALUE EDUCATION & HUMAN RIGHTS**

**Course Objectives**

- Understand the concept of human values, types of values, and the role of value education in personal and social development.
- Analyze the impact of global development on ethics and values, including cultural conflicts, media influence, and challenges faced by adolescents.
- Learn therapeutic measures for mental well-being, including meditation, yoga, and techniques to control emotions and promote positive behavior.
- Explore human rights concepts, their evolution, classification, constitutional provisions, and mechanisms for protection and redressal.

**Course Outcomes**

CO 1: Explain the importance of human values and value education for personal, national, and global development.

CO 2: Assess the ethical challenges posed by globalization, cross-cultural influences, and adolescent behavioral issues.

CO 3: Apply therapeutic techniques such as meditation and yoga for mental and emotional health improvement.

CO 4: Describe the framework of human rights, their legal provisions, and institutional mechanisms for safeguarding rights and addressing violations.

| **Course Code:** | **UGEN – 381** | |
|---|---|---|
| **Course:** | **VALUE EDUCATION & HUMAN RIGHTS** | **Credits: 4P** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | **Concept of Value Education**<br>• Meaning, definition, objectives, and importance of value education.<br>• Philosophical foundations of values – moral, ethical, spiritual, social, cultural, political, and economic values.<br>• Role of values in personal and professional life.<br>• Sources of values: family, society, religion, culture, and education.<br>• Value crisis in the modern world – materialism, consumerism, and loss of human touch.<br>• Role of education in value formation.<br>• Case studies of value-based living (e.g., Mahatma Gandhi, Swami Vivekananda, Mother Teresa). | **15** |
| **Unit-II** | **Human Rights: Foundations & Evolution**<br>• Definition, nature, and scope of human rights.<br>• Historical development of human rights: Magna Carta, American Bill of Rights, French Revolution, UN Charter.<br>• Universal Declaration of Human Rights (UDHR), 1948 – significance and key provisions.<br>• International Covenants on Civil, Political, Economic, Social, and Cultural Rights.<br>• Generations of Human Rights (Civil-Political, Economic-Social-Cultural, Collective-Solidarity Rights).<br>• Role of UNESCO, UNHRC, and other international organizations. | **25** |
| **Unit-III** | **Indian Perspective on Human Rights**<br>• Human rights in the Indian Constitution – Preamble, Fundamental Rights, and Directive Principles of State Policy.<br>• Fundamental Duties and their significance.<br>• Constitutional safeguards for minorities, women, SC/ST, and other vulnerable groups.<br>• Role of National Human Rights Commission (NHRC), State Human Rights Commissions (SHRCs).<br>• Human Rights and Social Justice in India – issues and challenges.<br>• Landmark Supreme Court cases on human rights in India. | **25** |
| **Unit-IV** | **Values in Personal and Social Life**<br>• Values in individual life: honesty, integrity, empathy, non-violence, tolerance, cooperation, and compassion.<br>• Interpersonal values – respect, trust, forgiveness, gratitude.<br>• Social values – equity, justice, freedom, secularism, pluralism, democracy.<br>• Gender equity and dignity of labor.<br>• Role of media and education in promoting social values.<br>• Civic responsibility, environmental ethics, and sustainable development. | **15** |
| | **Human Rights Issues & Challenges**<br>• Human rights violations – child labor, bonded labor, custodial violence, trafficking, discrimination, refugees.<br>• Human rights of marginalized groups – women, children, elderly, | |

| | | |
|---|---|---|
| **Unit-V** | differently-abled, tribals, LGBTQ+.<br>• Global issues: poverty, illiteracy, terrorism, displacement, communal violence, migration.<br>• Environmental rights – right to clean water, air, and sustainable environment.<br>• Human rights in the era of globalization and technology (digital rights, privacy, AI ethics).<br>• Case studies of human rights violations and movements. | **15** |
| **Unit-VI** | **Education for Values & Human Rights**<br>• Role of teachers, educational institutions, and curriculum in value inculcation.<br>• Pedagogical approaches for value education – storytelling, group discussion, role play, debates, moral dilemmas.<br>• Human rights education – objectives, strategies, and methodologies.<br>• Value-based leadership and good governance.<br>• Role of NGOs, civil society, and social movements in human rights protection.<br>• Building a culture of peace and non-violence through education.<br>• Project work, field visits, and community engagement. | **25** |
| | **Total** | **120** |

**Books Recommended:**


- Value education and human rights, By R. P. Shukla, Sarup & Sons
- Professional Ethics and Human Values, Premvir Kapoor, Khanna Publishing House (AICTE Recommended Textbook)
- Value Education And Education For Human Rights, By V.C. Pandey, Gyan Publishing House.
- Education for Values, Environment and Human Rights, By Y. K. Sharma, Published by Deep and Deep Publications.
- Human Rights: Twenty First Century Challenges, edited by V.N. Viswanathan (ed. By), Gyan Publishing House.
- Education for Values, Environment and Human Rights, By J. C. Aggarwal, Shipra Publications, 2005
- Human Rights Education: A Global Perspective, edited by Hemlata Talesra, Nalini Pancholy, Mangi Lal Nagda,Published by Daya Books.

**Paper Title: UGEN – 382: BASIC ACCOUNTING**

**Course Objectives**

- Understand fundamental accounting principles, the accounting process, and the role of accountants in financial reporting.
- Learn how to record, post, and correct transactions using journals, ledgers, and worksheets, including bank reconciliations.
- Develop skills to journalize and post adjusting and closing entries, and handle accounting for merchandising businesses including subsidiary ledgers.
- Gain proficiency in payroll accounting, preparing financial statements, adjusting accounts, and analyzing business financial performance.

**Course Outcomes**

CO 1: Define and apply accounting concepts and principles to analyze financial transactions and prepare balance sheets.

CO 2: Prepare charts of accounts, post journal entries to ledgers, reconcile bank statements, and prepare error-free worksheets.

CO 3: Journalize adjusting and closing entries, manage merchandising transactions, and maintain subsidiary ledgers for payables and receivables.

CO 4: Prepare payroll records, adjust inventory and other accounts, and create multiple-step income statements and classified balance sheets for merchandising businesses.

| **Course Code:** | **UGEN – 382** | |
|---|---|---|
| **Course:** | **BASIC ACCOUNTING** | **Credits: 4P** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | **Introduction to Accounting**<br>• Meaning, objectives, and importance of accounting.<br>• Users of accounting information – internal & external.<br>• Bookkeeping vs. Accounting.<br>• Basic accounting terms: assets, liabilities, capital, revenue, expenses, drawings, profit, loss, stock, etc.<br>• Accounting principles: concepts (business entity, going concern, money measurement, accrual, conservatism, dual aspect, matching).<br>• Accounting standards – overview. | **20** |
| **Unit-II** | **Double Entry System & Accounting Process**<br>• Double entry principle and accounting equation.<br>• Journal – meaning, features, format, rules of debit and credit.<br>• Ledger – posting from journal to ledger, balancing of accounts.<br>• Subsidiary books – cash book, purchase book, sales book, purchase return, sales return, petty cash book.<br>• Trial Balance – objectives, preparation, errors and their rectification. | **25** |
| **Unit-III** | **Bank Transactions & Reconciliation**<br>• Cash Book vs. Pass Book.<br>• Causes of differences between Cash Book and Pass Book.<br>• Bank Reconciliation Statement (BRS) – meaning, importance, preparation.<br>• Adjusted Cash Book method. | **15** |
| **Unit-IV** | **Final Accounts of Sole Proprietors**<br>• Meaning and preparation of Trading Account.<br>• Profit & Loss Account – preparation and adjustments (outstanding expenses, prepaid expenses, accrued income, depreciation, bad debts, provisions).<br>• Balance Sheet – preparation and classification of assets & liabilities.<br>• Adjustment entries and their effect on final accounts. | **20** |
| **Unit-V** | **Depreciation, Reserves & Provisions**<br>• Meaning, causes, and need for depreciation.<br>• Methods of depreciation – straight line, written down value, annuity, depletion.<br>• Accounting treatment of depreciation.<br>• Provisions and reserves – differences and importance. | **25** |
| **Unit-VI** | **Introduction to Partnership & Company Accounts**<br>• Partnership Accounts – features, partnership deed, capital accounts, interest on capital/drawings, profit-sharing ratio.<br>• Admission of a partner – goodwill, revaluation of assets and liabilities.<br>• Retirement & death of a partner – adjustments.<br>• Introduction to Company Accounts – shares, debentures, issue and forfeiture of shares (basic concepts). | **15** |
| | **Total:** | **120** |

**Books Recommended:**

- Basic Accounting: The step-by-step course in elementary accountancy, By Nishat Azmat, Andy Lymer, Hachette UK.
- Basic Accounting, By Rajni Sofat, PHI Learning Pvt. Ltd.
- BASIC ACCOUNTING, By SOFAT, RAJNI , HIRO, PREETI, PHI Learning Pvt. Ltd.
- Accounting for Beginners, By Kokab Rahman, Createspace Independent Pub, 2013

**Year - 2 Advanced Diploma (SEMESTER - IV)**

**Paper Title: UAMV – 401: VEHICLE PERFORMANCE AND TESTING**

**Job Role: Automobile Senior Technician**

**Course Objectives**

- Understand key vehicle performance parameters including fuel economy, acceleration, handling, and emission control systems.
- Learn various vehicle testing methods, including road tests, dynamometer testing, and specialized track tests.
- Study vehicle safety systems and auxiliaries, focusing on occupant protection, active/passive safety, and modern electronic safety aids.
- Explore crash testing techniques, noise and vibration mechanisms, and the instrumentation used for automotive testing and evaluation.

**Course Outcomes**

CO 1: Explain vehicle performance metrics and describe the function and testing of drivetrain components and emission control systems.

CO 2: Conduct and interpret vehicle testing procedures such as road tests, wheel alignment, noise testing, and laboratory evaluations.

CO 3: Identify safety standards and systems, and evaluate occupant safety features and electronic safety technologies.

CO 4: Analyze crash testing protocols and data acquisition, understand noise and vibration sources, and select appropriate testing instrumentation.

| **Course Code:** | **UAMV – 401** | |
|---|---|---|
| **Course:** | **VEHICLE PERFORMANCE AND TESTING** | **Credits: 3L+1T** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | VEHICLE PERFORMANCE PARAMETERS: Vehicle Performance parameters, Fuel economy, acceleration, deceleration, gradability, top speed, handling, comfort, life durability, EGR systems, and Vehicular systems: Suspension steering, Brakes & carriage unit testing, test procedure, Catalytic converters function &construction, Lambda close loop control system for gasoline vehicles. DRIVE TRAIN AND TESTING: Vehicular transmission performance: Characteristics and comparison of automotive clutches, Epicyclic transmission, Torque converter, testing of clutch, final drive and differential. Test procedure for gear box noise and shifting force. | **13** |
| **Unit-II** | VEHICLE TESTING: Vehicle Testing - Road test, Free acceleration test, Coast down test, Passer by noise test, Wheel alignment and balancing test, Test tracks û proving ground testing, high speed track, pavement track, corrugated track, mud track, steering pad, gradient track, deep wading through shallow water, Laboratory testing û testing on chassis dynamometer transition testing- Euro III onwards, accelerated testing, Virtual testing, Evaporative emission testing, Oil consumption testing | **17** |
| **Unit-III** | SAFETY SYSTEMS AND AUXILIARIES: Safety: Motor vehicle safety standards, active safety, passive safety, bio-mechanics Structural safety, energy absorption, ergonomic consideration in safety, Occupants safety systems like seat belts, head restrain, air bags, GPS , roll-over protection system, Electronic stability program. Particulate traps Function & construction. | **15** |
| **Unit-IV** | COLLISIONS AND CRASH TESTING: Crash testing: Human testing, Dummies, crashworthiness, pole crash testing, rear crash testing, vehicle to vehicle impact, side impact testing, crash test sensors, sensor mounting, crash test data acquisition ,Braking distance test<br>NOISE VIBRATION AND EMI: Noise & vibration: Mechanism of noise generation, engine noise & vibration, causes and remedies, road shocks wind noise & measurement, vehicle measurement testing. Automobile testing instrumentation: Sensors types and selection, Instrumentation for functional tests, Battery testing, endurance test, model test and full scale | **15** |
| | **Total:** | **60** |

**Books Recommended:**


- Automobile Mechanics, A.K. Babu, Khanna Publishing House (AICTE Recommended textbook)
- Wolt, Heinrich Hucho, Aerodynamics of road vehicles
- Bosch, Automotive Handbook
- George Pieters Barbara Pieters, Automotive Vehicle Safety
- Michel Plint Engine Testing Theory and Practice
- Gousha H. M., Engine performance Diagnosis & Tune Up Shop Manual
- J.G .Giles, Vehicle Operation & Performance.
- W. H. Crouse & D. L. Anglin, Motor Vehicle Inspection.
- SAE Transaction Papers 831814/820346/820367/820371/820375
- SAE handbook vol 2 & 3
- Automobile Engineering by Ramlingam
- Automobile engineering by Kripal Singh
- Automotive Mechanics by Josepf Heitner
- ARAI vehicle emission test manual
- Automobile Engineering by Rangawala

**Paper Title: UAMV – 491 VEHICLE PERFORMANCE AND TESTING LAB**

**Credit: 2P (Allotted Hours: 60)**

**List of Experiments:( Based on UAMV – 401)**

- Engine / vehicle performance, P.V. diagram, mechanical efficiency, volumetric efficiency and losses of fuel economy.
- Construction and working principle of EGR and catalytic convertor. Testing procedure of suspension, brake and steeringsystem.
- Exhaust emission testing, oil consumption testing and road test.
- Construction and operation of automatic clutch epicyclic transmission ad torque converter. Testing of clutch, gear box,final drive and differential
- Safety of driver and occupants like seat belt, air bags, GPS, ESP, functions and operations.
- Measurement of power, torque and speed of a vehicle
- Acceleration and braking performance test
- Measurement of vehicle Turing circle radius
- Demonstration of ABS
- Fuel consumption test of engine (volumetric & fuel flow meter)
- Different types of performance tyres
- Crash safety demonstration
- Real time OBD-II diagnostics
- Demonstration of EV & hybrid vehicle performance

**Paper Title: UAMV – 402: AUTOMOTIVE SAFETY**

**Job Role: Automobile Senior Technician**

**Course Objectives**

- Understand the fundamentals of vehicle body design for safety, including energy absorption and deceleration during impacts.
- Learn about active and passive safety concepts, and the design features that protect vehicle occupants.
- Study collision warning and avoidance technologies, including object detection and integration with braking systems.
- Explore comfort and convenience systems in vehicles, such as central locking, sensor-based controls, and environment monitoring.

**Course Outcomes**

CO 1: Explain vehicle safety design principles, including the concept of crumple zones and deformation behavior during collisions.

CO 2: Identify key safety equipment functions, such as seat belts, airbags, and steering column designs that enhance passenger safety.

CO 3: Describe collision warning systems, their working mechanisms, and how they interact with braking systems to prevent accidents.

CO 4: Demonstrate knowledge of vehicle comfort systems, including automatic adjustments, sensor-based controls, and driver assistance features.

**Maulana Abul Kalam Azad University of Technology, West Bengal**

*(Formerly West Bengal University of Technology)*

**B.Voc. in** Automobile Servicing Technology (UGC)

**(Effective for Academic Session 2024-2025)**

| **Course Code:** | **UAMV – 402** | |
|---|---|---|
| **Course:** | **AUTOMOTIVE SAFETY** | **Credits: 3L+1T** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | INTRODUCTION: Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.<br>SAFETY CONCEPTS: Active safety, driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, and speed and acceleration characteristics of passenger compartment on impact. | **13** |
| **Unit-II** | SAFETY EQUIPMENTS: Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steeringwheel, air bags, electronic system for activating air bags, bumper design for safety. | **17** |
| **Unit-III** | COLLISION WARNING AND AVOIDANCE: Collision warning system, causes of rear end collision, frontal object detection,rear vehicle object detection system, object detection system with braking system interactions. | **17** |
| **Unit-IV** | COMFORT AND CONVENIENCE SYSTEM: Steering and mirror adjustment, central locking system , Garage door openingsystem, tyre pressure control system, rain sensor system, environment information system. | **13** |
| | **Total:** | **60** |

**Books Recommended:**


- Bosch - “Automotive Handbook” - 5th edition - SAE publication - 2000.
- J. Powloski - “Vehicle Body Engineering” - Business books limited, London
- Ronald. K. Jurgen - “Automotive Electronics Handbook” - Second edition- McGraw-Hill
- A.K. Babu, Automobile Electricals and Electronics, Khanna Publishing House, New Delhi

**Paper Title: UAMV – 492 AUTOMOTIVE SAFETY LAB**

**Credit :2P (Allotted Hours: 60)**

**List of Experiments: (Based on UAMV – 402)**

- Aerodynamic body shape advantages
- Use of seat belt, automatic seat belt adjustment system
- Collapsible steering column servicing. Adjustment of steering wheel
- Operation of front and rear vehicle object detection system
- Rear view mirror adjustment
- Operation of central locking system tyre pressure control system, Dicky opening system and rain sensor system
- Servicing of door hinged and door lock.

**Paper Title: UAMV – 403: AUTO ELECTRICAL SYSTEMS & TRANSMISSION**

**Job Role: Automobile Senior Technician**

**Course Objectives**

- Understand the construction, working, and necessity of various types of clutches and gearboxes in automobiles.
- Learn the design and function of differential units, front and rear axles, and the properties and maintenance of wheels and tyres.
- Study the automotive electrical systems, including ignition, charging, and starting systems.
- Explore the operation and maintenance of lighting, horn, wipers, and battery systems in vehicles.

**Course Outcomes**

CO 1: Explain the working principles and types of clutches, gearboxes, universal joints, and propeller shafts used in automobiles.

CO 2: Identify different differential units and axle types, including their construction, working, and applications.

CO 3: Describe automotive electrical systems such as ignition, charging, and starting systems with their components and working.

CO 4: Demonstrate knowledge of vehicle lighting, horn, wipers, and battery types, functions, testing, and maintenance procedures.

| **Course Code:** | **UAMV – 403** | |
|---|---|---|
| **Course:** | **AUTO ELECTRICAL SYSTEMS & TRANSMISSION** | **Credits: 3L+1T** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | **Clutch:** Necessity of clutch in automobiles, Construction and working of a single plate, multiplate, centrifugal and semi - centrifugal clutch<br>**Gear Box:** Necessity of gear box in automobiles, Construction and working of a sliding mesh, constant mesh and synchromesh gear box, Universal Joints and Propeller Shaft, Necessity of Universal Joints & Propeller Shaft, Construction and working of cross or spider, yoke , ball and Trunion, and constant velocity type, universal type, Construction and working of enclosing type and hollow type propeller shaft, Construction and working of slip joint, Hotchkiss drive, torque tube drive, | **13** |
| **Unit-II** | **Differential Unit:** Necessity of differential, Construction and working of a differential, Differential lock and self lockingdifferential<br>**Front and Rear Axles:** Necessity of Front & Rear axle, Construction and working of live and dead axles, Construction and working of different types of stub axles, Construction and working of semi floating, three quarter floating and fully floating rear axles.<br>**Wheels and Tyres:** Function of wheel & tyres, Construction and working of Disc and spoke wheel, Types of rims and their construction, Construction & properties of tyres, Different tyre tread pattern, Specifications of a tyre, Tyre rotation, Vulcanizing and Retreading, Wheel balancing and static balancing | **15** |
| **Unit-III** | **ELECTRICAL SYSTEMS**<br>**Ignition System:** Introduction, Study of wiring of Magnet ignition, Battery Coil Ignition and Electronic Ignition System, **Charging System:** Introduction, Construction and working of charging dynamo (D. C. Generator), Working principle of cut - out, Voltage regulators - current regulators - construction and working, Construction & working of Alternator<br>**Starting System:** State the construction and working of a self starter (D. C. Motor), Working principle of bendix drive with a sketch, Solenoid construction and working | **17** |
| **Unit-IV** | **Lighting, Horn and Wipers:** Introduction, Working of Head lamp, side or parking light, tail or stop light, dash light, direction signal light, Adjustments of head lights, Working of Dipper, Dim light, Door light & Destination board light, Horn circuit construction and working, Working of wiper<br>**Battery:** Introduction, Types of Batteries: - Primary & Secondary Batteries, Parts of lead acid battery, alkaline Battery, and its functions, Electrolyte ratio - by weight & Volume Understand the ampere hour and watt - hour efficiency of the battery, 11. 6 Know the different methods of charging and trickle charging, Know the different methods of testing of a lead - acid battery for full charged and discharged, condition, Cell damage testing: - sulphation, desulphation | **15** |
| | **Total:** | **60** |

**Books Recommended:**

- Automotive Power Transmission Systems, Yingjin Zhang, Chris Mi
- Automobile Mechanical and Electrical Systems, Tom Denton
- A.K. Babu, Automobile Electricals and Electronics, Khanna Publishing House, New Delhi

**Paper Title: UAMV – 493 AUTO ELECTRICAL SYSTEMS & TRANSMISSION LAB**

**Credit: 2P (Allotted Hours: 60)**

**List of Experiments:( Based on UAMV – 403)**

- Construction and operation of clutching system
- Construction and operation gear boxes
- Layout of power transmission
- Construction and operation of differential
- Construction and operation of various axles
- Removing and installation of wheels and tyre
- Construction and operation of magneto and battery coil ignition system
- Construction and working of dynamo and alternator.
- Construction and working of starting system.
- Layout of charging system.
- Layout of various lighting system.
- Construction and operation of lead acid battery.
- Case study and trouble shooting of vehicle.

**Paper Title: UGEN – 481: ENVIRONMENTAL STUDIES**

**Course Objectives**

- Understand the multidisciplinary nature, scope, and importance of environmental studies along with natural resources and ecosystem concepts.
- Learn about biodiversity, its conservation, classification, threats, and the significance of India's biodiversity.
- Study various types of environmental pollution, their causes, effects, control measures, and disaster management strategies.
- Explore environmental ethics, global environmental issues, legislation, population dynamics, and the role of public awareness and technology in environmental protection.

**Course Outcomes**

CO 1: Explain the scope of environmental studies, classify natural resources, and describe ecosystem structure and functions.

CO 2: Identify biodiversity hotspots, threats to biodiversity, and conservation techniques including in-situ and ex-situ methods.

CO 3: Analyze different types of pollution, their impacts, and control methods along with disaster management and sustainable development issues.

CO 4: Discuss environmental ethics, international environmental challenges, relevant laws, population issues, and the integration of technology and social awareness in environmental health.

| **Course Code:** | **UGEN – 481** | |
|---|---|---|
| **Course:** | **ENVIRONMENTAL STUDIES** | **Credits: 4P** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | **Introduction to Environment & Natural Resources**<br>• Definition, scope, importance of Environmental Studies.<br>• Components of environment – lithosphere, hydrosphere, atmosphere, biosphere.<br>• Renewable & Non-renewable resources:<br>o Forest resources – uses, deforestation, afforestation, forest conservation.<br>o Water resources – uses, overexploitation, floods, droughts, conflicts over water, dams & their impacts.<br>o Mineral resources – exploitation, environmental effects of mining.<br>o Energy resources – renewable (solar, wind, hydro, biomass, geothermal) & non-renewable (coal, petroleum, natural gas, nuclear).<br>o Food resources – world food problems, sustainable agriculture.<br>• Role of an individual in conservation of natural resources. | **20** |
| **Unit-II** | **Ecosystems**<br>• Concept, structure & function of an ecosystem.<br>• Energy flow in an ecosystem – food chains, food webs, ecological pyramids.<br>• Types of ecosystems:<br>o Forest ecosystem<br>o Grassland ecosystem<br>o Desert ecosystem<br>o Aquatic ecosystem (ponds, rivers, oceans, wetlands).<br>• Biodiversity and its conservation:<br>o Levels of biodiversity – genetic, species, ecosystem.<br>o Value of biodiversity – consumptive, productive, social, ethical, aesthetic.<br>o Threats to biodiversity – habitat loss, poaching, pollution, invasive species.<br>o Conservation methods – in-situ & ex-situ. | **25** |
| **Unit-III** | **Environmental Pollution**<br>• Definition, causes, effects, and control measures of:<br>o Air pollution<br>o Water pollution<br>o Soil pollution<br>o Marine pollution<br>o Noise pollution<br>o Thermal pollution<br>o Nuclear hazards<br>• Solid waste management – causes, impacts, control measures.<br>• Role of individuals and communities in pollution prevention. | **15** |

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| **Unit-IV** | **Social Issues and Environment**<br>• Sustainable development – concept and strategies.<br>• Urban problems related to energy and environment.<br>• Climate change, global warming, acid rain, ozone layer depletion.<br>• Environmental ethics – issues and possible solutions.<br>• Environmental impact of resettlement and rehabilitation projects.<br>• Consumerism and waste products.<br>• Environmental movements in India – Chipko, Silent Valley, Narmada Bachao Andolan.<br>• Disaster management – floods, earthquakes, cyclones, landslides. | **25** |
| **Unit-V** | **Environmental Policies, Acts & Human Rights**<br>• Environment Protection Act, 1986.<br>• Air (Prevention and Control of Pollution) Act, 1981.<br>• Water (Prevention and Control of Pollution) Act, 1974.<br>• Wildlife Protection Act, 1972.<br>• Forest Conservation Act, 1980.<br>• Issues involved in enforcement of environmental legislation.<br>• Role of judiciary, public awareness, NGOs, and media.<br>• Environmental rights as human rights. | **15** |
| **Unit-VI** | **Human Population and Environment**<br>• Population growth, population explosion, and impact on environment.<br>• Human health & environment – communicable and lifestyle diseases.<br>• Family welfare programmes – role in controlling population.<br>• Environment & human rights – equity and social justice.<br>• Role of information technology in environment and human health (GIS, remote sensing, environmental monitoring).<br>• Case studies: population & resource consumption, health epidemics, sustainable urban development. | **20** |
| | **Total:** | **120** |

**Books Recommended:**

- M.P. Poonia & S.C. Sharma, Environmental Studies, Khanna Publishing House
- Mike Hulme, Climates and Cultures.
- Mark Garrett, Encyclopaedia of Transportation Social Science and Policy.
- Steel, Science An A - to - Z Guide to Issues and Controversies.
- John A Matthews, Encyclopaedia of Environmental Change.
- O.P. Gupta, Elements of Environmental Pollution Control,

  Khanna Publishing House

**Paper Title: UGEN – 482: QUALITY MANAGEMENT**

**Course Objectives**

- Understand the fundamentals of quality management, its evolution, and key philosophies by Deming, Juran, and Crosby.
- Learn process quality concepts along with graphical and statistical tools for process quality improvement, including the 7 QC tools.
- Study advanced quality techniques such as sampling, hypothesis testing, regression, control charts, process capability, TQM, Lean, JIT, Six Sigma, and quality standards like ISO 9001.
- Explore quality improvement methods including Quality Function Deployment, robust design, Taguchi methods, reliability analysis, and failure mode effect analysis.

**Course Outcomes**

CO 1: Explain the principles and evolution of quality management and the philosophies of renowned quality experts.

CO 2: Apply graphical and statistical tools to analyze and improve process quality effectively.

CO 3: Perform statistical quality control techniques including sampling, hypothesis testing, control charts, and use TQM, Lean, and Six Sigma concepts for process improvement.

CO 4: Demonstrate the ability to deploy quality improvement tools such as QFD, Taguchi methods, and FMEA to enhance product reliability and overall quality performance.

| **Course Code:** | **UGEN – 482** | |
|---|---|---|
| **Course:** | **QUALITY MANAGEMENT** | **Credits: 4P** |
| **Contents** | | |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit-I** | **Introduction to Quality Concepts**<br>• Definition of Quality – product-based, user-based, manufacturing-based, and value-based perspectives.<br>• Evolution of Quality – from inspection to Quality Control, Quality Assurance, and Total Quality Management (TQM).<br>• Importance of quality in business competitiveness.<br>• Dimensions of product and service quality.<br>• Quality gurus and their contributions – Deming, Juran, Crosby, Ishikawa, Taguchi, Feigenbaum.<br>• Cost of quality – prevention, appraisal, internal and external failure costs. | **25** |
| **Unit-II** | **Quality Planning & Quality Standards**<br>• Quality planning process – customer focus, requirement analysis, benchmarking.<br>• Quality function deployment (QFD) – House of Quality.<br>• ISO standards – ISO 9000 family, ISO 14000, ISO 22000, ISO 27000.<br>• Six Sigma – principles, DMAIC methodology, belt levels (Green, Black, Master Black Belt).<br>• Role of quality certification and auditing.<br>• National and International Quality Awards – Deming Prize, Malcolm Baldrige National Quality Award, Rajiv Gandhi National Quality Award. | **15** |
| **Unit-III** | **Statistical Quality Control**<br>• Role of statistics in quality management.<br>• Process variation – common causes vs. special causes.<br>• Control charts –<br>  ○ Variables (X-bar & R charts, X-bar & S charts).<br>  ○ Attributes (p-chart, np-chart, c-chart, u-chart).<br>• Acceptance sampling – single, double, and multiple sampling plans.<br>• Operating Characteristic (OC) curves.<br>• Process capability analysis (Cp, Cpk, Cpm). | **25** |
| **Unit-IV** | **Total Quality Management**<br>• Principles of TQM – customer focus, continuous improvement, employee involvement.<br>• Kaizen, 5S, and Poka-Yoke.<br>• Benchmarking – process, types, and benefits.<br>• Business Process Reengineering (BPR) and its relationship with TQM.<br>• Quality Circles – structure, role, and benefits.<br>• Role of leadership in quality improvement. | **15** |
| **Unit-V** | **Tools & Techniques for Quality Improvement**<br>• Basic quality tools – cause & effect diagram, check sheet, control chart, histogram, Pareto chart, scatter diagram, flow chart.<br>• Advanced tools – affinity diagram, tree diagram, matrix diagram, arrow diagram, PDPC.<br>• Failure Mode and Effect Analysis (FMEA).<br>• Root Cause Analysis (RCA). | **20** |

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| | • Just-In-Time (JIT) and Lean Manufacturing.<br>• Taguchi method for robust design. | |
| **Unit-VI** | **Quality in Services & Future Trends (20 Hours)**<br>• Service quality vs. manufacturing quality.<br>• SERVQUAL model – dimensions of service quality (tangibles, reliability, responsiveness, assurance, empathy).<br>• Customer relationship management (CRM) & customer satisfaction measurement.<br>• Quality in education, healthcare, and IT services.<br>• Role of technology in quality – Industry 4.0, Artificial Intelligence, and IoT in quality management.<br>• Future trends – sustainable quality management, green quality, and ethical quality practices. | **20** |
| | **Total:** | **120** |

**Books Recommended:**


- D. C. Montgomery, Introduction to Statistical Quality Control, John Wiley & Sons, 3rd Edition.
- Mitra A. , Fundamentals of Quality Control and Improvement, PHI, 2nd Ed. , 1998.
- M.P. Poonia & S.C. Sharma, Total Quality Management, Khanna Publishing House, (AICTE Recommended Textbook)
- J Evans and W Linsay, The Management and Control of Quality, 6'th Edition, Thomson, 2005
- Besterfield, D H et al. , Total Quality Management, 3rd Edition, Pearson Education, 2008.
- D. C. Montgomery, Design and Analysis of Experiments, John Wiley & Sons, 6th Edition, 2004
- D. C. Montgomery and G C Runger, Applied Statistics and Probability for Engineers, John Wiley & Sons, 4th Edition.