GURU KASHI UNIVERSITY

B. Voc. in Automobiles

Session: 2025-26

Department of Mechanical Engineering

GRADUATE OUTCOME OF THE PROGRAMME

The program focuses to develop an ability to apply appropriate knowledge in Mechanical Engineering to identify formulate analyze and solve complex engineering problems in order to develop sustainable computing solutions in broader economic societal and environmental contexts.

PROGRAMME LEARNING OUTCOMES

Engineering knowledge: Apply the knowledge of mathematics science engineering fundamentals and a mechanical engineering specialization to the solution of complex engineering problems

Problem analysis: Identify formulate review research literature and analyze complex mechanical engineering problems reaching substantiated conclusions using first principles of mathematics natural sciences and engineering sciences

Design/development of solutions: Design solutions for complex mechanical engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural societal and environmental considerations

Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments analysis and interpretation of data and synthesis of the information to provide valid conclusions

Modern tool usage: Create select and apply appropriate techniques resources and modern engineering and IT tools including prediction and modeling to complex mechanical engineering activities with an understanding of the limitations

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal health safety legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the mechanical engineering practice

Individual and team work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings

Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large such as being able to comprehend and write effective reports and design documentation make effective presentations and give and receive clear instructions

Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member and leader in a team to manage projects and in multidisciplinary environments

Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Semester: I									
Course Code	**Course Name**	**Type of Course**	**L**	**T**	**P**	**No of Credits**	**Int**	**Ext**	**Total Marks**
BAU101	Elements of Automobile	Core Course	**3**	0	0	**3**	25	50	**75**
BAU102	Manufacturing Technology	Core Course	3	0	0	3	25	50	**75**
BAU103	Communication Skills	Core Course	3	0	0	3	25	50	**75**
BAU104	Environmental Studies	Core Course	3	0	0	3	25	50	**75**
BAU105	Elements of Automobile- Practical	Skill Based	0	0	4	2	15	35	**50**
BAU106	Manufacturing Technology - Practical	Skill Based	0	0	2	1	10	15	**25**
BAU107	Basics of Programming - Practical	Skill Based	0	0	2	1	10	15	**25**
BAU108	Project – I	Skill Based	0	0	4	2	15	35	50
BAU109	Entrepreneurship Setup & Launch	Skill Based	0	0	4	2	15	35	50
Total			12	0	16	20	165	335	**500**

Semester: II									
Course Code	**Course Name**	**Type of Course**	**L**	**T**	**P**	**No of Credits**	**Int**	**Ext**	**Total Marks**
BAU201	Engineering Materials & Mechanics of Solids	Core Course	3	0	0	3	25	50	75
BAU202	Automobile Servicing and Maintenance	Core Course	3	0	0	3	25	50	75
BAU203	Elements of Fluid Mechanics & Machines	Core Course	3	0	0	3	25	50	75
BAU204	Engineering Materials & Mechanics of Solids - Practical	Skill Based	0	0	4	2	15	35	50
BAU205	Automobile Servicing & Maintenance - Practical	Skill Based	0	0	6	3	25	50	75
BAU206	Elements of Fluid Mechanics & Machines Practical	Skill Based	0	0	2	1	10	15	25
BAU207	Project -II	Skill Based	0	0	6	3	25	50	75
Value Added Course									
BAU208	Uni. Human Values & ethics/Environment& Ecology	VAC	2	0	0	2	15	35	50
Total			11	0	18	20	165	335	**500**

Semester: III									
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No of Credits**	**Int**	**Ext**	**Total Marks**
BAU301	Thermal Engineering	Core Course	3	0	0	3	25	50	75
BAU302	Chassis Body & Transmission	Core Course	3	0	0	3	25	50	75
BAU303	Theory of Machines	Core Course	3	0	0	3	25	50	75
BAU304	Thermal Engineering - Practical	Skill Based	0	0	2	1	10	15	25
BAU305	Chassis Body & Transmission - Practical	Skill Based	0	0	6	3	25	50	75
BAU306	Strength of Material - Practical	Skill Based	0	0	2	1	10	15	25
BAU307	Project –III	Skill Based	0	0	6	3	25	50	75
Elective –I									
BAU308	IC Engines	Discipline Elective-I	3	0	0	3	25	50	75
BAU309	Electric Vehicles								
Total			12	0	16	20	165	335	500

Semester: IV									
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No of Credits**	**Int**	**Ext**	**Total Marks**
BAU401	Internal Combustion Engines	Core Course	3	0	0	3	25	50	75
BAU402	Alternative Fuels & Pollution Control	Core Course	3	0	0	3	25	50	75
BAU403	Tyre Technology	Core Course	3	0	0	3	25	50	75
BAU404	Internal Combustion Engines - Practical	Skill Based	0	0	6	3	25	50	75
BAU405	Alternative Fuels & Pollution Control - Practical	Skill Based	0	0	2	1	10	15	25
BAU406	Fuels & Lubricants - Practical	Skill Based	0	0	2	1	10	15	25
BAU407	Project –IV	Skill Based	0	0	6	3	25	50	75
Elective –II									
BAU408	Non Commercial vehicles	Discipline Elective-II	3	0	0	3	25	50	75
BAU409	Instruments and Equipment								
Total			12	0	16	20	165	335	500

Semester: V									
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No of Credits**	**Int**	**Ext**	**Total Marks**
BAU501	Vehicle Body Engineering	Core Course	3	0	0	3	25	50	75
BAU502	Mechanics of Vehicles	Core Course	3	0	0	3	25	50	75
BAU503	Modern Vehicle Technology	Core Course	3	0	0	3	25	50	75
BAU504	Engineering Thermodynamics - Practical	Skill Based	0	0	6	3	25	50	75
BAU505	Computer Aided Design and Drafting Practical	Skill Based	0	0	6	3	25	50	75
BAU506	Project-V	Skill Based	0	0	6	3	25	50	75
Elective –III									
BAU507	Suspension and Damping Systems	Discipline Elective-III	3	0	0	3	25	50	75
BAU508	Engine Management principles								
Total			12	0	18	21	175	350	525

Semester: VI									
Course Code	**Course Title**	**Type of Course**	**L**	**T**	**P**	**No of Credits**	**T**	**P**	**Total Marks**
BAU601	Electric and Hybrid Vehicles	Core Course	3	0	0	3	25	50	75
BAU602	Automobile Refrigeration & Air Conditioning	Core Course	3	0	0	3	25	50	75
BAU603	Automotive Electrical & Electronic System	Core Course	3	0	0	3	25	50	75
BAU604	Mechatronics Practical	Skill Based	0	0	2	1	10	15	25
BAU605	Automobile Engineering - Practical	Skill Based	0	0	6	3	25	50	75
BAU606	Automotive Electrical & Electronic System Practical	Skill Based	0	0	2	1	10	15	25
BAU607	Project-VI	Skill Based	0	0	6	3	25	50	75
BAU608	Personality Development	VAC	2	0	0	2	15	35	50
Elective –IV									
BAU609	Vehicle safety principles	Discipline Elective-IV	3	0	0	3	25	50	75
BAU610	Quality Management in automobile Industry								
Total			14	0	16	22	185	365	550

SEMESTER- I

COURSE TITLE: ELEMENTS OF OFAUTOMOBILE

L	T	P	Credits
3	0	0	3

COURSE CODE: BAU101

Total Hours-45

Course Content

UNIT I

Classification of automobiles

According to number of wheels propulsion systems transmission drives Type of fuels Application & capacity Study of main specifications Components of an automobile-functions & layout of frame Frameless construction axles Steering system and Suspension system Braking system power train & drives Clutch Gear box final drive propeller shaft U-joints vehicle body wheels tyres & tubes **10 HOURS**

UNIT II

Selection of engine for two-wheeler three-wheeler & four-wheeler vehicles

Construction & working details of two strokes & four stroke petrol & diesel engines Fuel system Ignition system Starting system Charging system Lighting system Cooling system Lubrication system Combustion & combustion chambers **10 HOURS**

UNIT III

Steering system-

Requirements front axle details & steering geometry castor Camber toe in toe out steering axis inclination Steering linkages and different types of steering gear boxes their constructional & working details Concept and working of power steering Need types of suspension systems constructional details Characteristics of laminated coil springs Introduction to independent suspension Front & rear suspension systems of the vehicle shock absorbers **10 HOURS**

UNIT IV

Wheel Types and Construction

Wheel requirements types of wheels their constructional & working details rims & tyres types of tyre selection ordinary Radial tyres tubeless tyres their constructional details comparison & application wheel balancing Need and classification of brakes drum brakes and disc brakes Constructional & working details Introduction to hydraulic brake parking brake vacuum assisted hydraulic brakes air assisted hydraulic brakes Air brakes leading & trailing brake shoes Self-energizing brakes & ABS Working of master cylinder wheel cylinders tandem master cylinder characteristics of brake fluid **15 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- I

COURSE TITLE: MANUFACTURING TECHNOLOGY

COURSE CODE: BAU102

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Principles of metal casting

Pattern materials Type of patterns and allowance study of molding sand molding tools molding materials Classification of molds core elements of gating and rising system Casting defects description and operation of cupola special casting processes e g die casting Permanent mold casting centrifugal casting investment casting

10 HOURS

UNIT II

Classification of welding processes

Principles and equipments used in the following Processes - Gas Welding - Oxyacetylene gas welding equipment's and field of application Arc Welding - Metal Arc Carbon Arc Submerged Arc and Atomic Hydrogen welding Resistance Welding - Spot Seam Butt Percussion Welding Thermit welding – Soldering Brazing Standard welding symbol Flux Composition Properties and Function Electrodes Types of Joints and Edge Preparation Brazing and Soldering

15HOURS

UNIT III

Metals and Specifications for Sheets Common Processes tools and equipment metals used for sheets Standard Specification for Sheets Spinning Bending Embossing and Coining

UNIT IV

Basic Concepts and Classification of Forming Processes

Principles- Equipment used and Application of Following Processes-Forging Rolling Extrusion Wire Drawing Spinning Powder Metallurgy steps involved and applications

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- I

COURSE TITLE: ENVIRONMENTAL STUDIES

COURSE CODE: BAU103

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Introduction to Environmental Studies Scope and Importance

The multidisciplinary nature of Environmental Studies/Science Definition Scope Importance and Need for public awareness Dams and their effects on forests and tribal people Use and over-utilization of surface and groundwater floods drought conflicts over water Dams Benefits and problems Environmental effects of extracting and using mineral resources Effects of modern agriculture fertilizer-pesticide problems water logging salinity case studies Renewable and non-renewable energy sources use of alternate energy sources Ecosystems Concept of an ecosystem Structure and function of an ecosystem producers consumers and decomposers Energy flow in the ecosystem Ecological succession Food chains food webs and ecological pyramids Biodiversity and its conservation Hot-spots of biodiversity Threats to biodiversity Conservation of biodiversity In-situ and Ex-situ conservation of biodiversity **15 HOURS**

UNIT II

Environmental Pollution Overview and Causes

Environmental Pollution Definition causes effects and control measures of Air pollution Water pollution Soil pollution Marine pollution Noise pollution Thermal pollution Nuclear hazards Solid waste Management Causes effects and control measures of urban and industrial wastes Fireworks their impacts and hazards Pollution case studies **10 HOURS**

UNIT III

Social Issues and Sustainable Development

Social Issues and the Environment From Unsustainable to Sustainable development Urban problems related to energy Water conservation rain water harvesting watershed management Resettlement and rehabilitation of people its problems and concerns Environmental ethics Issues and possible solutions Consumerism and waste products Environmental Legislation (Acts and Laws) Issues involved in enforcement of environmental legislation Human Population and the Environment Population growth variation among nations with case studies Population explosion – Family Welfare programmes and Family Planning Programmes Human Rights Value Education Women and Child Welfare

10 HOURS

UNIT IV

Natural Disasters Floods Earthquakes Cyclones Landslides

Disaster management floods earthquake cyclone and landslides Man-made Disaster such as Fire Industrial Pollution Nuclear Disaster Biological Disasters Accidents (Air Sea Rail & Road) Structural failures (Building and Bridge) War & Terrorism etc Causes effects and practical examples for all disasters Prediction Early Warnings and Safety Measures of Disaster Role of Information Education Communication and Training in disaster management

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching 11Self-Learning Collaborative

SEMESTER- I

COURSE TITLE: COMMUNICATION SKILLS

COURSE CODE: BAU104

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I
Recognizing and Understanding Communication Styles
Definition of Communication Passive Communication Aggressive Communication Passive-Aggressive Communication Assertive Communication Verbal and Non-Verbal Communication Barriers and Gateways to Communication

10 HOURS

UNIT II
Types of Listening (theory /definition)
Tips for Effective Listening Academic Listening- (lecturing) Listening to Talks and Presentations Basics of Telephone communication Writing Skills Standard Business letter Report writing Email drafting and Etiquettes Preparing Agenda and writing minutes for meetings Making notes on Business conversations Effective use of SMS Case writing and Documentation

15 HOURS

UNIT III
Intrapersonal and Interpersonal Skills
Empathy (Understanding of someone else point of view) Intrapersonal skills Interpersonal skills Negotiation skills Cultural Aspects of Communication

10 HOURS

UNIT IV
Group Interaction and Communication
The Basics of Group Dynamics Group Interaction and Communication How to Be Effective in Groups Handling Miscommunication Handling Disagreements and Conflicts Constructive Criticism

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- I

COURSE TITLE: ELEMENTS OF AUTOMOBILE - PRACTICAL

COURSE CODE: BAU105

L	T	P	Credits
0	0	4	2

Total Hours-30

Course Content

UNIT I
Engine and Fuel Systems
Engine assembly and disassembly Service and adjust fuel and ignition systems **10 HOURS**

UNIT II
Transmission Brakes and Suspension
Inspect and repair transmissions Replace brake components and inspect suspension

12 HOURS

UNIT III
Electrical Cooling and Lubrication Systems
Test and repair electrical systems Maintain cooling and lubrication systems **10 HOURS**

UNIT IV Tyres Diagnostics and Safety Check tyres perform wheel alignment Use diagnostic tools follow safety procedures Complete a practical project **12 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- I

COURSE TITLE: MANUFACTURING TECHNOLOGY - PRACTICAL

COURSE CODE: BAU106

L	T	P	Credits
0	0	2	1

Total Hours-30

Course Content

UNIT I

Introduction and Safety Manufacturing Processes Overview Basic concepts and classifications of manufacturing processes Safety practices and personal protective equipment (PPE) Safety Procedures Essential safety protocols and use of personal protective equipment (PPE) in manufacturing environments **15 HOURS**

UNIT II

Machining Techniques

Lathe Operations Basic turning operations tool setup and part machining Milling and Drilling Basic milling and drilling operations machine setup and tool usage **10 HOURS**

UNIT III

Casting and Welding Casting Methods Introduction to sand casting and pattern making Welding Techniques Basic arc welding MIG/TIG welding operations and joint preparation **10 HOURS** UNIT IV

Quality Control and Maintenance

Dimensional Measurement Use of measurement tools (calipers micrometers) for quality control Routine Maintenance procedures for machines and common troubleshooting techniques **10 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- I

COURSE TITLE: BASICS OF PROGRAMMING - PRACTICAL

L	T	P	Credits
0	0	2	1

COURSE CODE: BAU107

Total Hours-30

Course Content

UNIT I

Introduction to Programming

Overview of Programming Concepts Basic programming terminologies Introduction to algorithms and flowcharts Setting Up the Development Environment Installing and configuring an IDE Writing and running a simple "Hello World" program

10 HOURS

UNIT II Basic Programming Constructs

Variables and Data Types Declaration and initialization Understanding primitive data types Operators Arithmetic relational and logical operators Control Structures Conditional statements (if if-else switch)Looping constructs (for while do-while)

15 HOURS

UNIT III

Functions and Modular Programming

Defining and Calling Functions Function declaration and definition Passing arguments and returning values Scope and Lifetime of Variables Local vs global variables

10 HOURS

UNIT IV

Arrays and Strings Arrays

Declaring initializing and accessing array elements Basic array operations (traversing sorting)Strings String operations (concatenation length comparison)String manipulation functions

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- I

COURSE TITLE: PROJECT I

COURSE CODE: BAU108

L	T	P	Credits
0	0	4	2

Total Hours-60

Course Content

Practical 1
Basic Engine Overhaul Objective To disassemble inspect and reassemble a basic internal combustion engine Tasks Disassemble the engine and document the condition of each component Clean and check each part for wear and tear Reassemble the engine and perform a test run Identify and rectify any issues encountered during reassembly **8 HOURS**

Practical 2
Automobile Electrical Systems Overview Objective To understand and demonstrate the operation of basic automobile electrical systems Tasks Create a wiring diagram for a basic automobile electrical system Assemble a simple electrical circuit using components like fuses relays and switches Test and troubleshoot the circuit for common electrical issues Document the functioning and problem-solving process **8 HOURS**

Practical 3 Automobile Maintenance Checklist Objective To create a comprehensive maintenance checklist for a specific vehicle model Tasks Research and compile a list of routine maintenance tasks for the selected vehicle Create a detailed checklist including oil changes filter replacements and tire inspections Develop a maintenance schedule and recommend best practices for each task Present the checklist and schedule to a group for feedback 8 **HOURS**

Practical 4 Vehicle Fluid Analysis Objective To analyze and interpret the condition of various vehicle fluids Tasks Collect samples of engine oil coolant brake fluid and transmission fluid Perform basic tests on each fluid (e g viscosity color contamination) Compare the test results with standard fluid specifications Prepare a report on the findings and recommend any necessary maintenance or fluid changes **8 HOURS**

Practical 5 Automobile Safety Inspection Objective To conduct a basic safety inspection of a vehicle and identify potential issues Tasks Develop a safety inspection checklist covering brakes lights tires and steering Perform the inspection on a vehicle and document the findings Identify any safety concerns and suggest corrective actions Create a presentation detailing the inspection process and results **15 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

Course Title: Entrepreneurship Setup & Launch	L	T	P	Cr.
Course Code: BAU109	0	0	04	02

Introduction: **Total Hours : 60**

This semester lays the foundation for the learner to understand what entrepreneurship is, beyond just starting a business. It introduces key ideas like problem-solving, value creation, and self-awareness. The learner will begin exploring basic business concepts while discovering their own interests and strengths.

Learners Objective:

1. Understand the core concepts of entrepreneurship through relatable, real-life examples.
2. Begin to see themselves as problem-solvers and creators.
3. Learn about business paths and choose one to try based on interest or local fit.
4. Launch a micro-hustle (online or offline) to earn their first income.
5. Build confidence and self-belief by doing.

Outcome: By the end of this semester, learners will start a simple business activity, earn their first income, and build belief in their ability to do business.

Guiding Principles/Approach:

This syllabus is built on principles of **experiential learning, growth mindset development**, and **identity-first learning**. Drawing from learning science and behavior design, the course shifts students from passive learning to *active doing*, where they try out small business activities in real contexts. The design helps students not just learn entrepreneurship, but begin to see themselves as entrepreneurs. Emphasis is placed on *small wins, peer collaboration, and locally relevant opportunities* to ensure learning feels achievable and connected to their realities. The curriculum focuses on conceptual understanding without heavy theory, combining *practical action, reflection, and*

collaboration. By making progress visible and success feel possible, it plants the seeds of self-reliance, initiative, and long-term motivation.

Semester Syllabus:

Format: 12 weeks, 4 hours/week | 2 credits
Revenue Target: ₹10,000

Week	Learning Goal	Measurable Outcome
1	Understand what entrepreneurship is and who can be an entrepreneur	Students define entrepreneurship in their own words and list 2 entrepreneurs from their local area or community
2	Connect personal identity to entrepreneurship (strengths, interests, struggles)	Students create a "value map" showing how a skill/interest/problem from their life could become a business opportunity
3	Learn about 5 business paths: content creation, dropshipping, cloud kitchen/food business, gig economy and local services	Students explore 1–2 examples from each domain and share one they're most curious to try and why
4	Choose a path and generate a basic business idea	Students write down a clear offer (what, for whom, why) and one way to reach their customer
5	Take first real action: message, post, pitch, or sell	Students reach out to or serve 1 real potential customer and record what happened

6	Reflect on first attempt and share with peers	Students share their result, a challenge faced, and one idea to improve next time
7	Improve and try again: aim for first ₹100	Students apply a change, try again, and aim to make their first ₹100 or get meaningful response
8	Learn how to identify and understand your target customer	Students talk to 2 potential customers or observe them and list 3 insights about their needs
9	Learn how to serve your target audience better	Students improve one part of their offer (product, delivery, messaging, or interaction) based on customer feedback or need
10	Explore core entrepreneurial values (resilience, honesty, effort)	Students reflect on 1 value they're building and show it in a business task or peer story
11	Focus on earning and staying consistent	Students complete a second earning task and track their consistency (e.g., same product or message for 3 days)
12	Reflect on earnings, grit, and how to keep going	Students record total earnings, one resilience moment, and one support system or habit they'll continue with

Weekly Component:

Component	Duration	Description
Learning Module	~1.5 hrs	- Introduces key concepts in a simple and engaging way - Includes, examples, and 1–2 interactive discussions or quizzes

Action Lab	~2 hrs	- Hands-on task on the weekly concept - Includes step-by-step guidance, templates, and worksheets - Ends with a submission (e.g., video, reflection, or proof of action)
Resources	Self-paced	- Supplementary videos, short readings, real-life stories, and tools to deepen understanding at their own pace

Evaluation Criteria

Evaluation Component	Description	Weightage
Weekly Task Completion	Timely submission of weekly tasks including reflections, activities, quizzes etc.	40%
Target Completion	Performance-based evaluation on hitting **revenue or profit targets** (e.g., generating ₹10,000 revenue)	30%
Final Project	A comprehensive project based on the semester's theme	30%

SEMESTER- II

COURSE TITLE: ENGINEERING MATERIALS & MECHANICS

COURSE CODE: BAU 201

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Introduction to Solid-State Materials

Bravais lattices Miller indices simple crystal structures Different kind of bonding Energy distribution of electrons in a metal Fermi level Conduction process Band theory of solids P and N type of semiconductors Statistics of holes and electrons Hall effect Effect of temperature on conductivity Lifetime and re-combination Drift and diffusion in PN junction Ferro magnetism Antiferro Semi and Super- conducting materials Properties Type of superconducting materials **15 HOURS**

UNIT II

Hooke's Law for Tension Compression and Shear

Concept of stress and strain Hooke's law - Tension Compression and Shear Stress-strain diagram - Poisson's ratio Elastic constants and their relationship - Deformation of simple and compound bars Thermal stresses – simple and Composite bars Principal plane principal stress maximum shearing stress - Uniaxial biaxial state of stress- Mohr's circle for plane stresses **15 HOURS**

UNIT III

Introduction to Engineering Materials for Mechanical Construction

Introduction to engineering materials for mechanical construction Composition Mechanical and fabricating characteristics and applications of various types of cast irons Plain carbon and alloy steels copper aluminum and their alloys like duralumin Brasses and bronzes cutting tool materials Super alloys thermoplastics Thermosets Limitations of conventional engineering materials Role of matrix in composites classification matrix materials Reinforcements metal matrix composites polymer-matrix composites Fiber-reinforced composites environmental effects on composites applications of composites **10 HOURS**

UNIT IV

Theory of Pure Torsion

Theory of pure torsion torsion of circular shafts and composite shafts **5 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- II

COURSE TITLE: AUTOMOBILE SERVICING AND MAINTENANCE

COURSE CODE: BAU 202

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Introduction to Maintenance Management

Importance of maintenance Types- preventive (scheduled) and breakdown (unscheduled) maintenance Requirements of maintenance Preparation of checklists Inspection schedules Safety precautions in maintenance Knowledge of free and paid service schedules fault diagnosis job cards warranty procedures log sheets and other forms **10 HOURS**

UNIT II

Maintenance of Engine Accessories

Lubrication system – lubricating/ engine oil top up oil changing cleaning methods visual and dimensional inspections Minor/major adjustments of various components maintenance of engine accessories- air filter battery cooling system electrical wiring in engine compartment Engine tune up top overhauling dismantling of engine components cleaning visual and dimensional inspections Minor/major reconditioning of various components reconditioning methods engine assembly special tools used for maintenance/ overhauling Servicing and maintenance of cooling systems lubrication system **15 HOURS**

UNIT III

Lubrication System Gear Oil Top-Up Oil Changing and Cleaning Methods

Lubrication system – lubricating/ gear oil top up oil changing cleaning methods Visual and dimensional inspections Minor/major adjustments of various components of transmission system Servicing and maintenance of clutch gear box propeller shaft Differential Servicing and maintenance of suspension system Brake system steering system wheel alignment and wheel balancing **10 HOURS**

UNIT IV

Checking Electrical Components for Functioning

Checking of electrical components for functioning checking of battery electrolyte top up terminal cleaning & protection methods Checking of starter motor checking of charging systems- fan belt tension checking and adjustment Testing methods for checking of ignitions system lighting system Fault diagnosis and maintenance of modern electronic controls Checking and servicing of dash board instruments **10 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative

Learning and Cooperative Learning

SEMESTER- II

COURSE TITLE: ELEMENTS OF FLUID MECHANICS & MACHINES

COURSE CODE: BAU203

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Introduction to Fluid Properties and Fluid Statics

Fluid properties Mass density specific weight specific volume Specific gravity Viscosity vapor pressure compressibility Surface tension and capillarity Fluid statics fluid pressure at a point Variation of pressure within a static fluid hydrostatic law - Pressure head Pascal's law Measurement of pressure - Piezometric tube manometry **10 HOURS**

UNIT II

Types of Fluid Flow and Flow Patterns Streamline Streak Line Path Line Fluid kinematics Lagrangian and Eulerian description of fluid flow –Velocity and acceleration of fluid particles Different types of fluid flow Description of flow pattern Streamline streak line path line Principle of conservation of mass - Continuity equation Fluid dynamics Euler's equation of motion along a streamline - Bernoulli's equation Practical applications of Bernoulli's equation in flow measurement devices like venturimeter orifice meter and Pitot tube Concept of impulse momentum equation & angular momentum principle with applications

15 HOURS

UNIT III

Laminar and Turbulent Flow Characteristics

Laminar and turbulent flow characteristics Laminar flow through circular pipes - Hagen Poiseuille law Major and minor losses in pipes pipe friction Darcy - Weisbach equation parallel series and branched pipes **8 HOURS**

UNIT IV

Construction and working of Pelton Francis and Kaplan Turbines Hydraulic turbine Classification difference between impulse and reaction turbine Construction and working of Pelton turbine Francis turbine and Kaplan turbine velocity triangle heads and efficiencies Pumps classification difference between positive and non-positive displacement pumps Construction and working of reciprocating pump Centrifugal pump-heads of a centrifugal pump priming Velocity triangle work done efficiencies of centrifugal pump Check valve Servo valves Proportional valves and Cartridge valves cut off Valve **12 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- II

COURSE TITLE: ENGINEERING MATERIALS & MECHANICS OF SOLIDS PRACTICAL

COURSE CODE: BAU204

L	T	P	Credits
0	0	4	2

Total Hours-60

Course Content

UNIT I
Testing of Engineering Materials Tensile Test Conduct tensile tests to measure material strength and ductility
8 HOURS

UNIT II
Mechanics of Materials Testing Bending Test Perform bending tests on beams to determine deflection and stress
12 HOURS

UNIT III
Structural Analysis and Testing Beam Deflection Measurement Measure and analyze deflection of beams under various loads
12 HOURS

UNIT IV
Failure Analysis and Characterization Microscopic Examination Examine and analyze material microstructures to identify defects
12 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- II

COURSE TITLE: AUTOMOBILE SERVICING & MAINTENANCE - PRACTICAL

COURSE CODE: BAU205

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

UNIT I

Basic Servicing

Engine Oil Change Perform oil change and oil filter replacement **8 HOURS**

UNIT II

Lubrication and Fluid Checks

Fluid Levels Check and top-up engine fluids (coolant brake fluid transmission fluid)

12 HOURS

UNIT III

Engine Maintenance

Engine Tune-Up Replace spark plugs and fuel filter **12 HOURS**

UNIT IV

General Inspections

Brake and Tire Inspection Inspect and adjust brakes and tires for optimal performance

12 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- II

COURSE TITLE: ELEMENTS OF FLUID MECHANICS & MACHINES PRACTICAL

COURSE CODE: BAU206

L	T	P	Credits
0	0	2	1

Total Hours-30

Course Content

UNIT I

Fluid Properties and Measurement

Measurement of Fluid Properties Measure properties like viscosity and density using viscometers and hydrometers

10 HOURS

UNIT II

Fluid Flow Experiments

Flow Rate Determination Measure flow rates using flow meters and calculate discharge in pipes

10 HOURS

UNIT III

Hydraulic Machines

Pump Performance Testing Test and analyze performance of various pumps (centrifugal reciprocating)

10 HOURS

UNIT IV

Fluid Machinery

Turbine Testing Conduct performance tests on turbines and analyze efficiency

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- II

COURSE TITLE: PROJECT 1

COURSE CODE: BAU207

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

Project 1

Engine Performance Analysis

Objective Evaluate and compare the performance of different types of engines (e g petrol diesel hybrid) Tasks Research and gather data on engine specifications and performance metrics Conduct experiments to measure engine efficiency power output and fuel consumption Analyze the data and present findings with recommendations for performance improvements **8 HOURS**

Project 2

Automobile Suspension System Design Objective Design and test a suspension system for a specific type of vehicle Tasks Study the principles and components of automobile suspension systems Create a detailed design for a suspension system tailored to a particular vehicle model Build a prototype or simulation model and test its performance Evaluate the prototype and suggest any necessary modifications **8 HOURS**

Project 3 Automobile Electrical Systems DiagnosticsObjective Diagnose and troubleshoot common electrical issues in automobiles Tasks Learn about the various electrical systems and components in modern vehicles Develop diagnostic procedures for identifying common electrical faults Use diagnostic tools to perform tests and repairs on a vehicle's electrical system Document the diagnostic process and provide a detailed report on findings and solutions

8 HOURS

Project 4 Vehicle Emission Control Systems\Objective Analyze and improve vehicle emission control systems to reduce pollutants Tasks Study emission control technologies and regulations Examine and test the emission control systems in various vehicles Propose and implement modifications or enhancements to reduce emissions Prepare a report detailing the impact of the modifications on emission levels **8 HOURS**

Project 5 Automobile Maintenance and Repair Manual Objective Create a comprehensive maintenance and repair manual for a specific vehicle model Tasks Research and compile information on common maintenance procedures and repair techniques Write clear step-by-step instructions for performing routine maintenance and common repairs Include illustrations or diagrams to support the instructions Test the manual by using it for actual maintenance or repair tasks and make necessary revisions **15 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

Course Title: UNIVERSAL HUMAN VALUES AND ETHICS
Course Code: BAU208

L	T	P	Credits
2	0	0	2

Total hours: 30

Course Content

UNIT I **8 Hours**

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT II **7 Hours**

Understanding Harmony in the Human Being - Harmony in Myself!
Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', UnderstandingtheharmonyofIwith the Body: Sanyam and Swasthya;correctappraisalofPhysicalneeds, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya

UNIT III **7 Hours**

Understanding Harmony in the Family and Society- Harmony in Human. Human Relationship Understanding Harmony in the family – the basic unit of human interaction Understanding values inhuman-humanrelationship;meaningofNyayaandprogramforitsfulfillmenttoensureUbhay-tripti;Trust(Vishwas) and Respect (Samman) as the foundational values of relationship Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to worldfamily!

UNIT IV **8 Hours**

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

SEMESTER- III

COURSE TITLE: THERMAL ENGINEERING

COURSE CODE: BAU301

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Introduction to Thermodynamics

Introduction to Thermodynamics Concepts of systems control volume State properties equilibrium Quasi-static process reversible & irreversible process Cyclic process Zeroth 1st and 2nd Law and their applications Concept of heat engine and heat pump

10 HOURS

UNIT II

Thermodynamic Cycles and IC Engine

Performance Thermodynamic and mechanical cycles Carnot cycle air standard cycles- Otto Diesel Deviation of actual IC engine cycles from air standard cycles

10 HOURS

UNIT III

Applications of Compressed Air and Compressor Classification

Applications of compressed air Classification of compressor- reciprocating-rotary single stage-multi stage Supercharger Principles of turbine operation types of turbine- gas turbine applications of turbine

10 HOURS

UNIT IV

Introduction to IC Engine Components and Operation

Definition types fundamentals and operation components Function and constructional details Fuels and lubricants for IC engines characteristics thereof Introduction to air conditioning system Refrigeration cycle- components and working **15 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- III

COURSE TITLE: CHASSIS BODY TRANSMISSION

COURSE CODE: BAU302

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Chassis Layout and Frame Types

Types of chassis layout with reference to power plant location and drive Vehicle frames- Types of frames – Two Three four wheelers & HV General form & dimensions materials Frame stresses frame sections cross members Proportions of channel sections Constructional details loading points sub frames passenger car frames X member type frame Box section type frame testing of frames bending and torsion test effect of brake application of frame stresses truck frames defects **10 HOURS**

UNIT II

Steering Suspension Brake Systems and Drive train Components

Steering suspension brake system requirements front axle details & geometry construction & working details of rack and pinion type steering Worm & nut with recirculating ball type steering Concept and working of power steering (hydraulic & electronic) Suspension systems requirements independent and dependent suspension front & rear suspension systems of the vehicle Different type of brake system conventional drum type brakes disc brakes self energizing brakes & ABS characteristics of brake fluid Tyre selection cross ply radial tyres tubeless tyres their construction details comparison & application Hotch-kiss drive torque-tube drive and radius rods Propeller shaft universal joints Front wheel drive Constant velocity joints Differential principle Construction details of differential **10 HOURS**

UNIT III

Car Body Design Materials and Bus Body Classification

Body Details Standard design of a car body general requirements of a car body Body materials body surface- corrosion protection Body finishing components- bumpers exterior strips impact strips glazing door latches etc Safety- active passive Classification of bus bodies – Based on distance traveled Capacity of the bus and style & shape Construction of conventional and integral type buses & comparison **10 HOURS**

UNIT IV

Compound and Automatic Transmissions

Compound transmissions Automatic transmission - principle general description types

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- III

COURSE TITLE: THEORY OF MACHINES

COURSE CODE: BAU303

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I
Gears & Gear Trains
Introduction law of gearing types of gear tooth profile- involute & cycloidal Interference in involute tooth gears and methods for its prevention Contact ratio path of contact arc of contact Efficiency and center distance of spiral gears Types of Gear trains Simple Compound Epicyclic Reverted gear train Tabular method for finding the speeds of elements in epicyclic gear train Differential gear box (no numerical treatment) **10 HOURS**

UNIT II
Kinetic Analysis of Mechanisms Inertia force and torque
D'Alembert's principle dynamically equivalent system force analysis of reciprocating engine mechanism
10 HOURS

UNIT III
Balancing Static and dynamic balancing of rotary and reciprocating masses
Primary and secondary forces and couples Direct and reverse cranks balancing of single cylinder Multi cylinder- in-line and V-engines
10 HOURS

UNIT IV
Vibrations Basic concepts and definitions vibration measuring instruments free and forced vibrations Types of damping Equivalent Springs Free vibrations with and without damping (Rectilinear Torsional & Transverse) Over under & critical damping damping factor Logarithmic decrement equivalent viscous damping Coulomb damping Forced vibrations with viscous damping magnification factor Frequency response curves vibration isolation and transmissibility Whirling of Shafts and Critical speeds

15 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- III

COURSE TITLE: THERMAL ENGINEERING - PRACTICAL

COURSE CODE: BAU304

L	T	P	Credits
0	0	2	1

Total Hours-30

Course Content

UNIT I
Heat Transfer Experiments
Conduct Heat Transfer Experiments Perform experiments on conduction convection and radiation
10 HOURS

UNIT II
Thermodynamic Cycles Test
Thermodynamic Cycles Analyze performance of thermodynamic cycles (e g Carnot Otto Diesel)

10 HOURS
UNIT III
Boilers and Heat Exchangers
Boiler and Heat Exchanger Testing Conduct tests on boiler efficiency and heat exchanger performance
12 HOURS

UNIT IV Refrigeration and Air Conditioning Refrigeration System Testing Measure and evaluate performance of refrigeration and air conditioning systems
12 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- III

COURSE TITLE: CHASSIS BODY & TRANSMISSION - PRACTICAL

COURSE CODE: BAU305

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

UNIT I
Chassis Layout and Frame Construction
Chassis Layout Analysis Inspect and understand different chassis layouts and power plant locations
10 HOURS

UNIT II
Frame Testing and Maintenance
Frame Testing Conduct bending and torsion tests on vehicle frames
10 HOURS

UNIT III Transmission Systems Automatic Transmission Principles Study and test the principles and types of automatic transmissions
12 HOURS

UNIT IV Transmission Service and Adjustments Transmission Servicing Perform servicing and adjustments on transmission systems
12HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- III

COURSE TITLE: STRENGTH OF MATERIAL – PRACTICAL

COURSE CODE: BAU306

L	T	P	Credits
0	0	2	1

Total Hours-30

Course Content

UNIT I

Tensile Testing

Tensile Test Conduct tensile tests on materials to determine tensile strength and elongation

10 HOURS

UNIT II

Bending and Flexural Testing

Bending Test Perform bending tests on beams to measure deflection and bending stress

10 HOURS

UNIT III

Shear and Compression Testing

Shear Test Measure shear stress and strain on specimens Compression Test compressive strength of materials using compression machines **12 HOURS**

UNIT IV

Impact and Hardness Testing

Impact Test Conduct Charpy or Izod impact tests to evaluate material toughness Hardness Test Perform hardness tests (Brinell Rockwell) to measure material hardness **12 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- III

COURSE TITLE: PROJECT III

COURSE CODE: BAU307

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

Project 1

Automobile Suspension System Analysis Objective To study and analyze different types of suspension systems used in automobiles Tasks Research various suspension systems (e g independent dependent) Create a comparative analysis of their performance Design a model or simulation to demonstrate how different systems affect ride quality and handling Prepare a report summarizing findings and recommendations **10 HOURS**

Project 2

Automotive Emission Control Systems Objective To investigate and evaluate various emission control technologies Tasks Study the working principles of emission control systems (e g catalytic converters EGR systems) Analyze the effectiveness of these systems in reducing pollutants Conduct experiments or simulations to measure emission levels Develop a presentation or report on the impact of these technologies on environmental sustainability

10 HOURS

Project 3

Electric Vehicle Charging Infrastructure Design Objective To design and propose a comprehensive electric vehicle (EV) charging infrastructure for a city or community Tasks Research current EV charging technologies and standards Analyze the demand for charging stations in a specific area Design a layout for the installation of charging stations considering factors like accessibility and power supply Create a report or presentation detailing the design and implementation plan **10 HOURS**

Project 4

Automobile Engine Performance Optimization Objective To optimize the performance of a specific automobile engine Tasks Select an engine and identify performance parameters (e g fuel efficiency power output) Perform tests to gather baseline data Experiment with different tuning techniques or modifications to improve performance Document the optimization process and present findings in a detailed report **10 HOURS**

Project 5

Automotive Safety System Evaluation Objective To evaluate the effectiveness of various automotive safety systems Tasks Study different safety systems (e g ABS traction control airbags) Conduct simulations or real-world tests to assess their effectiveness in preventing accidents and protecting occupants Analyze data to compare the performance of these systems under various conditions Prepare a comprehensive report or presentation on the findings and recommendations for safety improvements **10 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- III

COURSE TITLE: IC ENGINES

COURSE CODE: BAU308

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Contents

Unit-1 **10 Hours**

Operation fundamentals

Working principles of IC engines, classification-SI, CI engine, 2 stroke, 4 stroke, I C engine components- constructional details and working.

Unit–II **11 Hours**

Engine systems

Cooling system, lubrication, fuel supply, valve operation and valve timing, ignition system

Unit–III **12 Hours**

Fuel and combustion

SI Engine- fuels, fuel mixture preparation, fuel combustion process, normal and abnormal combustion, products of combustion, pollutants

CI engines- fuels, fuel injection system, fuel combustion process normal and abnormal combustion, products of combustion, pollutants

Unit-IV **12 Hours**

Performance and testing

Engine parameters- bore, stroke, capacity, compression ratio, compression pressure

Performance parameters-Engine RPM, Torque, Power- IHP, BHP,fuel consumption, efficiency-thermal, brake Engine testing- Measurement of IHP, BHP, Specific fuel consumption, Heat balance sheet, thermal efficiency.

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- III

COURSE TITLE: ELECTRIC VEHICLES

COURSE CODE: BAU309

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Contents

Unit-1 **10 Hours**

Introduction: define fuel economy, carbon foot print, factors affecting fuel economy, possible actions, alternative energy sources- hybrid in history, hybrid cars. Basic concept of electric traction, introduction to various electric drive train topologies.

Unit-II **11Hours**

Drive train structure: Conventional drive train, parallel drive train, series hybrid Drivetrain, combined (split) hybrid, all-wheel drive hybrid, merits and demerits of different drive trains.

Unit-III **12Hours**

Components of a hybrid electric drive train: Electric energy storage devices- lead acid, nickel based, lithium based batteries, merits and demerits of different type of batteries, battery wear, battery management, electrical machines, power electronics, electrified auxiliary system, additional mechanical devices- power split.

Unit-IV **12 Hours**

Case Studies: Design of a hybrid car, Design of an electric car

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: INTERNAL COMBUSTION ENGINES

COURSE CODE: BAU401

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Operation fundamentals

Working principles of IC engines classification-SI CI engine 2 stroke 4 stroke I C engine components- constructional details and working

10 HOURS

UNIT II

Engine systems

Cooling system lubrication Fuel supply Valve operation and valve timing ignition system

10 HOURS

UNIT III

Fuel and combustion

SI Engine Fuels fuel mixture preparation Fuel combustion process Normal and abnormal combustion products of combustion pollutants CI engines- fuels fuel injection system Fuel combustion process normal and abnormal combustion Products of combustion pollutants

10 HOURS

UNIT IV

Performance and testing

Bore stroke capacity compression ratio Compression pressure Performance parameters- Engine RPM Torque Power- IHP BHP fuel consumption efficiency- thermal brake Engine testing- Measurement of IHP BHP Specific fuel consumption Heat balance sheet thermal efficiency

15 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: ALTERNATIVE FUELS & POLLUTION CONTROL

COURSE CODE: BAU402

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Pollutants from SI and CI Engines Environmental and Health Impacts Various pollutants from SI and CI engines effects of pollutants on environment and human beings Estimation of petroleum reserves need for alternative fuels Potential alternative fuels (alcohols oxygenates hydrogen LPG NG biogas vegetable oils and fuel cell) Merits and demerits of various alternative fuels Various vegetable oils for diesel engines problems in using vegetable oils in diesel engines methods to improve the engine performance using vegetable oils

10 HOURS

UNIT II

Emissions from SI engines and their control Emission formation in SI engines (CO HC and NOx) effect of design and operating variables on emission formation Control techniques -thermal reactor exhaust gas recirculation Three-way catalytic convertor and charcoal canister control for evaporative emission- positive crankcase ventilation for blow by gas control

10 HOURS

UNIT III

Emissions from CI engines and their control Emission formation in CI engines (HC CO NOx aldehydes smoke and particulates) Effect of design and operating variables on emission formation Control techniques exhaust gas recirculation NOx selective catalytic reduction Diesel oxidation catalytic convertor diesel particulate filter NOx versus particulates –trade off

10 HOURS

UNIT IV Emission measuring instruments and test procedures Principle of operation of emission measuring instruments used in SI and CI engines Measurement of CO2 and CO by NDIR hydrocarbon emission by FID Chemiluminescent analyser for NOx Liquid and Gas chromatograph spot sampling and continuous indication type smoke meters (Bosch AVL and Hartridge smoke meters) emission test procedures – Euro and Bharat norms **15 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: TYRE TECHNOLOGY

COURSE CODE: BAU403

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Tyres Evolution Types and Properties

Introduction Importance of types History Current status functions of pneumatic tyres Applications types of tyres desirable tyre properties Classification of tyres based on carcass tyre profile Geometry sizing & designation tyre components Principle of pneumatic tyre requirements of pneumatic tyres **10 HOURS**

UNIT II

Tyre Design

General motion forces heat buildup types of bonding Set of service conditions tyre size requirements and safety requirements Tread design general role of foot print area and factors affecting tread life Various types of tread pattern Carcass design role of foot print area and factors affecting tread life Various types of tread pattern Carcass design Role of various fibers used in carcass estimation of number of piles Bead design single bead multiple beads and various configurations of wires in bead assembly **15 HOURS**

UNIT III

Manufacture Technology

General introduction role of various mixing ingredients Various recipes Compound mixing equipment extrusion of components Tyre cord wire cord manufacture calendaring tyre manufacture Mold procurement component preparation Green tyre building pre curing curing and post curing operations/treatments **10 HOURS**

UNIT IV

Tyre testing/ Evaluation Methods General safety standards carcass strength Resistance to bead unseating machine simulation test Indoor laboratory testing field-test on road proving ground Latest testing techniques **10 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: INTERNAL COMBUSTION ENGINES - PRACTICAL

COURSE CODE: BAU404

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

UNIT I

Introduction and Basic Operations Engine Disassembly and Assembly Procedures for safely disassembling and assembling an internal combustion engine including handling and storage of components
12 HOURS

UNIT II

Fuel and Lubrication Systems

Fuel System Maintenance Testing and maintaining different types of fuel systems (carbureted fuel injection) including fuel pump injectors and carburetor
8 HOURS

UNIT III

Cooling and Exhaust Systems

Cooling System Maintenance Procedures for changing coolant bleeding the system and maintaining components like radiators water pumps and thermostats
12 HOURS

UNIT IV

Ignition Systems and Engine Tuning

Engine Tuning Procedures for tuning engines including timing and valve adjustments using diagnostic tools and troubleshooting common engine problems
12 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: ALTERNATIVE FUELS & POLLUTION CONTROL - PRACTICAL

COURSE CODE: BAU405

L	T	P	Credits
0	0	2	1

Total Hours-30

Course Content

UNIT I

Introduction to Alternative Fuels

Practical Session on Bio fuels Production process of biodiesel and ethanol hands-on experiment on transesterification (biodiesel production) and testing the properties of biodiesel vs conventional diesel **10 HOURS**

UNIT II

Hydrogen and Natural Gas as Alternative Fuels

Practical Session on Natural Gas Vehicles Conversion of conventional vehicles to natural gas installing CNG kits and performance and emission testing of CNG vehicles **12 HOURS**

UNIT III

Pollution Control Technologies

Practical Session on Exhaust After-treatment Systems Inspecting and maintaining catalytic converters DPF SCR systems and retrofitting pollution control devices **8 HOURS**

UNIT IV

Integrated Systems and Future Trends

Practical Project on Integrated Alternative Fuel Systems Developing a prototype using an alternative fuel combining multiple alternative fuels in a single vehicle and performance testing of the integrated system **15 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: FUELS & LUBRICANTS - PRACTICAL

COURSE CODE: BAU406

L	T	P	Credits
0	0	2	1

Total Hours-30

Course Content

UNIT I
Introduction to Fuels and Lubricants
Identify and test the properties of various fuels and lubricants using appropriate testing methods
8 HOURS
UNIT II
Fuel Handling and Storage Conduct practical exercises on proper handling storage and quality control of fuels
12 HOURS

UNIT III
Lubrication Systems Maintenance Perform routine maintenance tasks including oil changes and filter replacements in various lubrication systems
12 HOURS

UNIT IV
Diagnostics and Troubleshooting
Diagnose and troubleshoot common issues in fuel and lubrication systems using diagnostic tools and techniques
12 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: PROJECT IV

COURSE CODE: BAU407

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

Project 1

Automotive Diagnostics System Development\Objective Develop a system for diagnosing common automotive issues using sensors and data analysis Tasks Research common automotive problems and their symptoms Design a diagnostic tool or software to identify these issues Implement and test the tool using simulated or real vehicle data Create a user manual and documentation for the system **10 HOURS**

Project 2

Electric Vehicle Battery Management System (BMS)Objective Design and develop a Battery Management System for electric vehicles to monitor and manage battery performance Tasks Study the working principles of BMS in electric vehicles Design a BMS circuit including monitoring balancing and protection features Implement the BMS on a prototype or simulation platform **10 HOURS**

Project 3

Automotive Suspension System Analysis and OptimizationObjective Analyze and optimize the performance of an automotive suspension system for improved handling and comfort Tasks Study the different types of suspension systems and their components Use simulation software to model and analyze the performance of a suspension system Identify potential improvements and optimize the design Test the optimized system on a test bench or vehicle **10 HOURS**

Project 4

Smart Parking System Using IoTObjective Develop a smart parking system that utilizes Internet of Things (IoT) technology to manage parking spaces efficiently Tasks Design a system architecture incorporating IoT sensors and communication modules Implement a prototype system that detects available parking spaces and provides real-time information to users Test the system in a real-world parking environment **8 HOURS**

Project 5 Automotive Fuel Efficiency Improvement Analysis Objective Analyze and implement strategies to improve fuel efficiency in internal combustion engine vehicles Tasks Study factors affecting fuel efficiency such as engine tuning aerodynamics and driving habits Implement modifications or adjustments to a vehicle to enhance fuel efficiency Conduct tests to measure the impact of these modifications on fuel consumption Analyze the results and present recommendations for improving fuel efficiency **10HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: NON-COMMERCIAL VEHICLE

COURSE CODE: BAU408

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT-I **10 Hours**

The Power Unit

Two stroke and four stroke SI & CI engine Construction and Working, merit sand demerit, Symmetrical and unsymmetrical valve & port timing diagrams, scavenging process

UNIT-II **12 Hours**

Fuel and Ignition Systems

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, Starting system - Kick starter system – Self-starter system, recent technologies

UNIT-III **12 Hours**

Chassis and Sub-Systems

Main frame for non-commercial vehicles, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear control sin two wheelers ,Front and rear suspensionsystems,Shockabsorbers,Panelmetersandcontrolsonhandlebar, Free wheeling devices

UNIT-IV **11 Hours**

Brakes and Wheels

Drum brakes & Disc brakes Construction and Working and itsTypes, Front and Rear brake links layouts. Brake actuation mechanism, Spoked wheel, cast wheel, Disc wheel & its merits and demerits, Tyres and tubes Construction & its Types, Steering geometry

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- IV

COURSE TITLE: INSTRUMENTS AND EQUIPMENT

COURSE CODE: BAU409

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT-I **10 Hours**

Metrology and Instrumentation: Metrology- definition, objectives, and necessity. Precision Measurement, limits fits and tolerances, measuring instruments- classification, linear measurement- Vernier caliper, micrometer, dial gauge. Angular measurement- combination set, plain surface measurement- level surface gauge, surface plate.

Instrumentation- modes of measurement- primary or direct, secondary or indirect involving one translation, territory- indirect measurement involving two conversions

UNIT II **11 Hours**

Servicing Equipment: Garage, service station, tune-up, specification and application of-aircompressor, hydraulic hoist, electro mechanical hoist, jack (mechanical, hydraulic), car washer and automatic car washer, grease dispenser, oil sprayer, tyre changer, wheel balance, wheel aligner, use of vacuum gauge, compression gauge, cam (dwell) angle and r.p.m. tester, battery Tester, spark plug cleaner and tester, ignition timing light, fuel injector tester, fuel consumption tester, cylinder leakage tester, radiator tester, exhaust gas analyzer, smoke meter, on- board/ smart diagnostic tool

UNIT-III **13 Hours**

Engine repair, measuring, testing and reconditioning equipment: Specification and use of- torque wrench, pneumatic wrench, piston ring compressor and expander, piston ring filer, groove cleaner, scrapers,Valve lifter and valve spring tester, inside & outside micrometer, dial micrometer, cylinder bore gauge , cylinder boring machine and honing machine, crankshaft and camshaft grinding machine, connecting rod aligner, line boring machine, valve refacing, valve seat cutting and grinding machine, cylinder head refacing machine

UNIT-IV **10 Hours**

Electrical repair instruments: Specification and use of- soldering iron, digital multimeter, growler, battery charger, head light beam aligner, alternator voltage regulator tester, test bench for starter motor and alternator.

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- V

COURSE TITLE: VEHICLE BODY ENGINEERING

COURSE CODE: BAU501

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Auto Body

Introduction main features and functions of body requirements Types saloon convertibles Limousine estate car racing and sports car Visibility regulations driver's visibility tests for visibility Frame construction- tubular interlaced channel section Ladder type car frame truck frame

10 HOURS

UNIT II

Body Structures

Frameless construction integral construction Semi- unitary or endo- skeleton unitary with sub frame Car body paneling special purpose bodies Passenger and luggage requirements all metal bodies Coach built bodies auto floors cowl assembly Front end assembly roof assembly doors and door fittings

10 HOURS

UNIT III

Body Materials

Requirement of body material type- specification Timber- plywood fiberboard Steel Mild steel – angle channel strips Aluminum alloy- sheets strips channel etc Rivets/ screws glass- colored glass toughened glass fiber reinforced

10 HOURS

UNIT IV Safety Standards Safety standards regarding- anchorage instruments/ control Windshield glass wipers doors windows Roofs head rests safety belts air bags

8 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- V

COURSE TITLE: MECHANICS OF VEHICLES

COURSE CODE: BAU502

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Fundamentals of Kinematics and Mechanisms

Definition of Link kinematics pair kinematics chain Mechanism in versions and machines Degree of freedom Simple examples of mechanism with Lower pairs Four bar chain and inversion Slider crank chain and inversion Double slider crank chain and it's inversion Higher pairs Ackerman steering principle Davis steering mechanics **12 HOURS**

UNIT II

Vehicle Dynamics and Performance Resistances

Traction and Stability Analysis Air grade and rolling resistances tractive effort Traction Inertia load drawbar pull and power required to propel a vehicle Calculations of acceleration and tractive effort required in case of front wheel drive Rear drive and four – wheel drive centrifugal force and its effects on vehicle stability **12 HOURS**

UNIT III

Braking Dynamics and Vehicle Stability

Braking friction and limits of braking retardation and braking force Calculations in case of front wheel rear wheel and all wheel braking Weight transfer during braking stopping distance and stopping time **10 HOURS**

UNIT IV

Flywheels and Balancing Types Dynamics and Energy Management Fly Flywheel – its types weight and moment of inertia Fluctuation of energy for flywheel concepts of static and dynamic balancing **10 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- V

COURSE TITLE: MODERN VEHICLE TECHNOLOGY

COURSE CODE: BAU503

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Suspension Brakes and Safety Air Suspension–Closed Loop Suspension Anti Skid Braking System Retarders Regenerative Braking Safety Cage-Airbags-Crash Resistance - Passenger Comfort **10 HOURS**

UNIT II

Trends in Power Plants Hybrid Vehicles – Stratified Charge/ Lean Burn Engines-Hydrogen Engines Battery Vehicles– Electric Propulsion with Cables – Magnetic Track Vehicles

10 HOURS

UNIT III

Advance Techniques in Traffic Management Vehicle & traffic navigation system global positioning system Advanced traffic control devices Intelligent Transport System **12 HOURS**

UNIT IV

Control systems in Automobiles Automotive application of sensors Engine management systems Electronic transmission control Multiplex wiring systems On-board navigation systems **12 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- V

COURSE TITLE: ENGINEERING THERMODYNAMICS - PRACTICAL

L	T	P	Credits
0	0	6	3

COURSE CODE: BAU504

Total Hours-45

Course Content

UNIT I

Basic Thermodynamic Properties

Practical Measurement of specific heat capacities of various materials using a calorimeter

8 HOURS

UNIT II

Thermodynamic Cycles and Engines Practical

Performance testing and efficiency analysis of internal combustion engines (e g Otto or Diesel)

12 HOURS

UNIT III

Heat Transfer Mechanisms Practical Experiments to measure and analyze heat transfer by conduction convection and radiation

12 HOURS

UNIT IV

Refrigeration and Air Conditioning Practical Evaluation of refrigeration system performance including coefficient of performance and cooling capacity

12 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- V

COURSE TITLE: COMPUTER AIDED DESIGN AND DRAFTING - PRACTICAL

COURSE CODE: BAU505

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

UNIT I

Introduction to CAD Software and Basic Drawing Techniques
Practical Create basic 2D shapes and drawings using CAD software
8 HOURS

UNIT II

Advanced Drawing Techniques and 2D Drafting Practical Apply advanced drawing tools dimensioning and annotations in 2D drafts
12HOURS

UNIT III

3D Modeling and Visualization Practical Develop and render 3D models using CAD software
12HOURS

UNIT IV Design and Drafting Projects Practical Complete a comprehensive design project involving both 2D drafting and 3D modeling
12 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- V

COURSE TITLE: PROJECT V

COURSE CODE: BAU506

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

Project 1

Electric Vehicle Conversion Objective Convert a conventional internal combustion engine (ICE) vehicle into an electric vehicle (EV) Tasks Analyze the existing ICE vehicle components Design the electric drive train system Integrate the battery management system Retrofit the vehicle with electric components Test the converted vehicle's performance and efficiency **10 HOURS**

Project 2

Advanced Driver Assistance Systems (ADAS) Integration Objective Develop and integrate ADAS features such as lane-keeping assistance adaptive cruise control and collision avoidance in a vehicle Tasks Research existing ADAS technologies Design the system architecture for integrating ADAS Implement sensors and software for ADAS Test the system for reliability and safety Analyze the system's impact on driving experience **10 HOURS**

Project 3

Automotive Aerodynamics Optimization Objective Design and test modifications to a vehicle's body to reduce aerodynamic drag and improve fuel efficiency Tasks Conduct a baseline aerodynamic analysis of the vehicle Design modifications using computational fluid dynamics (CFD) Fabricate prototypes of aerodynamic enhancements Perform wind tunnel testing or on-road testing Evaluate the impact on fuel efficiency and performance **10 HOURS**

Project 4

Hybrid Power train Development Objective Design and prototype a hybrid power train system that combines an internal combustion engine with an electric motor Tasks Design the hybrid system architecture Develop control algorithms for power distribution Integrate the system into a test vehicle Evaluate performance fuel efficiency and emissions Research hybrid power train configurations **10 HOURS**

Project 5

Vehicle Telematics System Objective Develop a vehicle telematics system for real-time monitoring and data collection of vehicle performance and driver behaviour Tasks Design the telematics system architecture Integrate GPS accelerometer and other sensors into the vehicle Develop a cloud-based platform for data analysis Implement a user interface for real-time monitoring Analyze collected data to provide insights on vehicle usage and maintenance

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: SUSPENSION AND DAMPING SYSTEMS

COURSE CODE: BAU507

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT –I

11 Hours

Automotive chassis: Definition; chassis layout; types of chassis layout with reference to power plant location, steering position and drive on wheels; chassis components; chassis classification; Automotive frames: Construction; functions; load sacting; materials; types; frame cross sections; frame diagnosis and service; dimensions of wheel base; wheel track; chassis overhang and ground clearance.

UNIT –II

11 Hours

Front axle & steering system: Functions, construction & types of front axle; front wheel geometry; front wheel drive; steering mechanisms; steering linkages & layout; types of steering gear boxes; power & power assisted steering; electronic steering; four-wheel steering; terminology-reversible steering, under- steering, over-steering, turning radius.

UNIT –III

12 Hours

Suspension system: Need; factors influencing ride comfort; types; suspension springs-leaf spring, coil spring & torsion bar; spring materials; independent suspension; rubber suspension; pneumatic suspension; hydraulic suspension, shock absorbers-liquid & gas filled.

UNIT –IV

11 Hours

Wheel: Forces acting on wheels, construction of wheel assembly, types-spoke, disc & built-up wheels; wheel balancing; wheel alignment; Tyres: Static & rolling properties of tyres, construction details, types of tyres-pneumatic & hydraulic; types of tyre-wear & their causes; tyre rotation. Bearings: Functions; classification of bearings; bearing materials; automotive bearings.

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

COURSE TITLE: ENGINE MANAGEMENT PRINCIPLES

COURSE CODE: BAU508

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT –I

10 Hours

ME-SFI voltage supply function, ME-SFI fuel ignition and injection system function, To measure the output voltage & to observe the output wave for mofa crank shaft sensor, To measure the output voltage & to observe the output wave form of a camshaft sensor, ME-SFI engine speed signal function.

UNIT –I

11 Hours Synchronizing fuel injection and firing order function, ME-SFI fuel supply function, ME-SFI fuel pump actuation function, ME-SFI consumption signal function, ME-SFI fuel reserve signal function, ME-SFI cam shaft adjustment function, ME-SFI electronic adjustment function, ME-SFI idle speed control function, ME-SFI throttle valve damping function, ME-SFI O2 sensor control function, ME-SFI oxygen sensor heating function.

UNIT –I

11 Hours

Study of principle of working, application, location and effect of sensors- Cam shaft sensor, Crankshaft position sensor, coolant temperature sensor, air temperature sensor, HFM sensor, charge pressure sensor, accelerator pedal sensor, oil sensor. CDI ignition On function. CDI Turbo charging function.

UNIT –I

13 Hours

CDI Fuel supply function.CDI Main injection function. CDI Intel shut off part function. CDI Pre-glow function. CDI Start-up glowing and after- glowing function. CDI EGR function. CDI emission control function.CDI starting function.CDI idle speed/driving mode function.CDI start quantity control function. CDI Idle speed control function. CDI quantity control function. CDI anti jerk control function. CDI limiting full load injection quantity function.

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: ELECTRIC AND HYBRID VEHICLES

COURSE CODE: BAU601

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Fuel Economy and Carbon Footprint

Define fuel economy carbon footprint factors affecting fuel economy possible actions alternative energy sources- hybrid in history Hybrid cars Basic concept of electric traction introduction to various electric Drive train topologies **10 HOURS**

UNIT II

Drive train structure

Conventional drive train parallel drive train Series hybrid Drive train combined (split) hybrid All-wheel drive hybrid merits and demerits of different drive trains **10 HOURS**

UNIT III

Components of a hybrid electric drive train Electric energy storage devices- lead acid nickel based Lithium based batteries merits and demerits of different type of batteries battery wear battery management Electrical machines power electronics electrified auxiliary system additional mechanical devices- power split **15HOURS**

UNIT IV

Case Studies

Design of a hybrid car Design of an electric car Specifications and salient features of Toyota Prius Toyota- Camry Honda- Insight Maruti-CiazMahindra- e2O etc merits and demerits

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: AUTOMOBILE REFRIGERATION & AIR CONDITIONING

COURSE CODE: BAU602

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Fundamentals and Applications of Refrigeration Systems

Refrigeration Principles of refrigeration Performance parameters Types of refrigeration systems Study of simple Vapor compression refrigeration system and System components Applications of refrigeration- Need of transport refrigeration introduction to food preservation Types of transport refrigeration systems **8 HOURS**

UNIT II

Refrigerants Properties

Classification Selection and Environmental Impact Refrigerants Definition desired properties like thermodynamic Chemical & physical and classification Selection of refrigerants Effect on ozone depletion and global warming introduction to alternative refrigerants

10 HOURS

UNIT III

Psychometric Principles and Applications Charts Processes and Properties Psychometric properties of air Use of Psychometric charts & tables Representation of psychometric processes on the chart such as heating and Cooling with humidification and dehumidification adiabatic dehumidification chemical dehumidification and mixing processes

15 HOURS

UNIT IV

Automotive Climate Control Systems Principles

Factors and Seasonal Considerations Air conditioner-Heating Systems Factors contributing the Cooling/ Heating in automobiles (car/bus) Concept of bypass factor Sensible heat factor Apparatus Dew Point Room Sensible Heat Factor (RSHF) Gross Sensible Heat Factor (GSHF) summer Winter and year-round air-conditioning systems **12 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: AUTOMOTIVE ELECTRICAL & ELECTRONIC SYSTEM

COURSE CODE: BAU603

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT I

Storage Battery

Principle of lead acid cells plates and their characteristics containers and separators Electrolyte and their preparation voltmeter Effect of temperature on electrolyte specific gravity Capacity and efficiency methods of charging from D C Mains defects and remedies of batteries Care of idle and new batteries Recent development in batteries **10 HOURS**

UNIT II

Generator/ Alternator

Principle of generation of direct current AC generator details DC generator charging circuit voltage and current regulators Cutout -construction working and adjustment **10 HOURS**

UNIT III

Starter Motor & Drives

Battery motor starting system condition at starting Behavior of starter during starting series motor and its characteristics Consideration affecting size of motor types of drives starting circuit **10 HOURS**

UNIT IV

Wiring and Lighting System

Insulated and earth return systems 12 volts system Fusing of circuits low and high voltage automobile cables Diagram of typical wiring system Principle of automobile illumination Headlamp mounting and construction sealed beam auxiliary lightings Horn windscreen-wipers signaling devices electrical fuel pump fuel oil and temperature gauge (Dash board instruments) **15 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: MECHATRONICS - PRACTICAL

COURSE CODE: BAU604

L	T	P	Credits
0	0	2	1

Total Hours-30

Course Content

UNIT I
Introduction to Mechatronics Systems Practical Building Basic Mechatronics Systems - Assemble simple mechatronics projects involving sensors actuators and microcontrollers to understand system integration
10 HOURS

UNIT II
Sensors and Actuators Practical Working with Sensors and Actuators - Interface various sensors (e g temperature proximity) and actuators (e g motors solenoids) with a microcontroller Develop control systems to process sensor data and drive actuators **10 HOURS**

UNIT III
Control Systems and Programming Practical Developing Control Algorithms - Write and implement control algorithms (eg PID control) for automated systems using a programmable logic controller (PLC) or microcontroller Test and optimize the control performance in different scenarios
10 HOURS

UNIT IV Integration and Testing Practical Design and Implement a Mechatronics Project - Complete a comprehensive project that integrates mechanical components electronic systems and control algorithms Test and refine the project to ensure it meets design specifications and functions correctly
15HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: AUTOMOBILE ENGINEERING - PRACTICAL

COURSE CODE: BAU605

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

UNIT I
Engine Components and Maintenance
Practical Disassemble inspect and reassemble engine components perform routine maintenance tasks such as spark plug replacement and valve adjustments
10 HOURS

UNIT II
Transmission and Drive train Systems
Practical Service and maintain manual and automatic transmissions inspect and repair drive train components like differentials and drive shafts
10 HOURS

UNIT III
Suspension Steering and Brake Systems
Practical Inspect and repair suspension systems steering mechanisms and brake systems perform maintenance tasks such as brake pad replacement and suspension adjustments

10 HOURS
UNIT IV
Electrical Systems and Diagnostics
Practical Diagnose and repair electrical issues using diagnostic tools test and repair components like batteries alternators and sensors

10 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: AUTOMOTIVE ELECTRICAL & ELECTRONIC SYSTEM – PRACTICAL

COURSE CODE: BAU606

L	T	P	Credits
0	0	2	1

Total Hours-30

Course Content

UNIT I
Introduction to Automotive Electrical Systems
Electrical System Basics Testing and diagnosing automotive batteries starters and alternators using multimeters and diagnostic tools
10 HOURS

UNIT II
Transmission and Drive train Systems
Wiring and Connectors Inspecting repairing and replacing automotive wiring and connectors Understanding wiring diagrams and circuit troubleshooting
10 HOURS

UNIT III
Suspension Steering and Brake Systems
ECUs and Sensors Testing and calibrating electronic control units (ECUs) and various sensors (eg oxygen sensors throttle position sensors) using diagnostic equipment **12 HOURS**

UNIT IV
Electrical Systems and Diagnostics
Advanced Diagnostics Performing advanced diagnostics and troubleshooting on complex electrical systems including anti-lock braking systems (ABS) airbags and infotainment systems
12 HOURS

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: PROJECT VI

COURSE CODE: BAU607

L	T	P	Credits
0	0	6	3

Total Hours-45

Course Content

Project 1

Development of an Autonomous Vehicle System Objective Design and develop an autonomous vehicle prototype using sensors cameras and AI algorithms to navigate and make driving decisions Tasks Research on existing autonomous vehicle technologies Design the system architecture including sensors and control algorithms Integrate hardware and software components Test the prototype in controlled environments Analyze the performance and suggest improvements **10 HOURS**

Project 2

Electric Vehicle (EV) Battery Management System Objective Create a comprehensive battery management system (BMS) for an electric vehicle focusing on efficiency safety and battery life optimization Tasks Study the different types of batteries used in EVs Design a BMS circuit that monitors battery health and efficiency Develop software for real-time data analysis and alerts Test the system with different battery models Present a report on potential improvements and innovations in BMS **10 HOURS**

Project 3

Hybrid Vehicle Power train Optimization Objective Analyze and optimize the power train of a hybrid vehicle to improve fuel efficiency and reduce emissions Tasks Study the components and working principles of hybrid power trains Conduct simulations to understand power distribution between the internal combustion engine and electric motor Propose and implement optimization techniques Test the optimized power train under various driving conditions Evaluate the results and suggest future research directions **10 HOURS**

Project 4

Advanced Telematics System for Fleet Management Objective Design and implement an advanced telematics system for managing a fleet of vehicles focusing on real-time tracking diagnostics and fuel management Tasks Research existing telematics systems and identify gaps Design a system that integrates GPS onboard diagnostics and fuel management modules Develop software for data collection analysis and reporting Deploy the system in a test fleet and monitor performance Prepare a report on the impact of the system on fleet efficiency and cost savings **10 HOURS**

Project 5

Retrofitting a Conventional Vehicle to Electric Objective Convert a conventional internal combustion engine vehicle to an electric vehicle focusing on the challenges and solutions in the retrofitting process Tasks Study the mechanics and electronics of the conventional vehicle Design a plan for removing the internal combustion engine and integrating an electric motor and battery system Source and install the necessary components Conduct performance tests and analyze the results Document the process and challenges encountered during the conversion **10 HOURS**

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

Course Title: PERSONALITY DEVELOPMENT PROGRAMME
Course Code: BAU608

L	T	P	Credits
2	0	0	2

Total Hours:30

UNIT-I **10Hours**

Introduction to Generic Skills: Importance of Generic Skill Development (GSD), Global and Local Scenario of GSD, Life Long Learning (LLL) and associated importance of GSD.

Managing Self: Knowing Self for Self Development- Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc., Managing Self – Physical- Personal grooming, Health, Hygiene, Time Management, Managing Self – Intellectual development -Information Search: Sources of information, Reading: Purpose of reading, different styles of reading, techniques of systematic reading, Note Taking: Importance of note taking, techniques of note taking, Writing: Writing a rough draft, review and final draft. Managing Self – Psychological, Stress, Emotions, Anxiety-concepts and significance, Techniques to manage the above.

UNIT-II **5Hours**

Managing in Team: Team - definition, hierarchy, team dynamics, Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background, Communication in group - conversation and listening skills.

UNIT-III **10 Hours**

Task Management: Task Initiation, Task Planning, Task execution, Task close out, Exercises/case studies on task planning towards development of skills for task management

Problem Solving: Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving, Different approaches for problem solving. Steps followed in problem solving. Exercises/case studies on problem solving.

UNIT-IV **5Hours**

Entrepreneurship: Introduction, Concept/Meaning and its need, Competencies/qualities of an entrepreneur, Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level. Market Survey and Opportunity Identification (Business Planning)- How to start a small scale industry, Procedures for registration of small-scale industry, List of items reserved for exclusive manufacture in small-scale industry, Assessment of demand and supply in potential areas of growth, understanding business opportunity, Considerations in product selection, Data collection for setting up small ventures. Project Report Preparation- Preliminary Project Report, Techno-Economic Feasibility Report, Exercises regarding "Project Report Writing" for small projects.

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: QUALITY MANAGEMENT IN AUTOMOBILE INDUSTRY

COURSE CODE: BAU610

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT –I

12 Hours

Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

UNIT –I

12 Hours

Input /output process Model, Juran trilogy, PDCA Cycle, 5–'S' Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratificationanalysis,Scatterdiagram,Controlcharts,Controlchartforvariables&processcapability, Control chart for attributes

UNIT –I

11 Hours

Affinity diagram, Relationship diagram, Tree diagram, Matrix diagram, Matrix data analysis, Arrow Diagram, Process decision programme chart (PDPC), Concept of bench marking, Reason to bench marking, Bench marking process, Types of bench marking, Benefits of bench marking

UNIT –I

10 Hours

JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban & 2 Bin Systems

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning

SEMESTER- VI

COURSE TITLE: VEHICLE SAFETY PRINCIPLES

COURSE CODE: BAU609

L	T	P	Credits
3	0	0	3

Total Hours-45

Course Content

UNIT –I

11 Hours

Automotive vehicle testing for Safety: Introduction to active & passive vehicle safety systems, occupant safety system- seat belts and belttighteners, front air bag, side air bag, rollover protection system

UNIT –II

11 Hours

Braking test (asperIS11852-2001), ABS performance & Traction control test Seatbelt anchorage testing, Horn, lighting installation and mirror, test.

UNIT –IIII

13Hours

Collapsible steering column testing: Frontal crash test, side door intrusion, interior and exterior test. Body block test (S-11939-1996), Introduction to the offset, Frontal impact test (IS-11939-1996 & (ECE94), Lateral Impact(ECER95),AIS-029:Survivalspaceforoccupants,pedestrianprotectiontest and other upcoming standards.

UNIT –IV

10 Hours

Motor Vehicle Act (1988), Central Motor Vehicles Rules (1989) and subsequent amendments

Transaction Mode

Lecture Seminar e-Team Teaching e-Tutoring Dialogue Peer Group Discussion Mobile Teaching Self-Learning Collaborative Learning and Cooperative Learning