Curriculum for Undergraduate Degree (B.VOC) in Automobile Servicing (w.e.f. AY: 2021-22)

Part II: Detailed Curriculum

THIRD SEMESTER
THEORY

Paper: IT Tools (BAS301)
Credits: 3
Course Contents:

I. Computer Organization & OS: User perspective.
- Understanding of Hardware.
- Basics of Operating System.

II. Networking and Internet.
- Network Safety concerns.
- Network Security tools and services.
- Cyber Security.
- Safe practices on Social networking.

III. Office automation tools:
- Spreadsheet.
- Word processing.
- Presentation.

IV. Multi Media Design: (Open Source Design Tools).
- Interface and Drawing Tools in GIMP.
- Applying Filters.
- Creating and handling multiple layers.
- Using Stamping and Smudging tools.
- Importing pictures.

V. Troubleshooting: Hardware, Software and Networking.
- Commonly encountered problems.
- (Monitor: No display, KB/Mouse not responding, monitor giving beeps, printer not responding, check for virus, Delete temporary files if system is slow, adjust mouse speed).

Work Integrated Learning IT – ISM
- Identification of Work Areas.
- Work Experience.

Reference Books:

1. IT Tools, R.K. Jain, Khanna Publishing House
2. Information Security & Cyber Laws, Sarika Gupta, Khanna Publishing House
3. Mastering PC Hardware & Networking, Ajit Mittal, Khanna Publishing House

Paper: Total Quality Management
Code: BAS302
Credits: 3

Course Contents:

Unit: 1 Introduction, Basic concepts of total quality management
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: 2 Continuous process improvement
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, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

Unit: 3 Management planning tools & Benchmarking
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: 4 Just in time(JIT)
JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban & 2 Bin Systems

Unit: 5 Total productive maintenance (TPM)
Concept of Total Productive Maintenance, Types of maintenance, OEE (Overall Equipment Efficiency), Stages in TPM implementation, Pillars of TPM, Difficulties faced in TPM implementation.

Reference Books:

1. Total Quality Management, S.C. Sharma, M.P. Poonia, Khanna Publishing House

Paper: Automobile Engines
Code: BAS 303
Credits:3
Course Contents:

UNIT1
(A) Fundamentals of Thermodynamics: Internal energy, Enthalpy, Mechanical Equivalent of Heat,

Conservation of energy. First and Second Law of thermodynamics. P-V diagram. Reversible process. Various thermodynamic processes. Entropy, General case for change of entropy of a gas. Change of entropy during various processes. Temperature-entropy diagram. Simple numerical problem

(B) Air standard cycles: Otto cycle, Diesel cycle, Air standard efficiency of Otto and Diesel cycle. Effect of compression ratio on efficiency. Simple numerical problems. Graphical representation of ideal and actual cycle. Comparison between actual and ideal cycles. Reasons for variation. Mean effective pressure. Work done during the cycle.

UNIT2

(A) I.C. Engines' operation: Working of two stroke cycle and four stroke cycle petrol and diesel engines. Valve timing diagrams. Port timing diagrams. Classification of I.C. Engines.
(B) Reciprocating Engine Details: Construction, function, material and manufacturing process of: (a) Cylinder Block- 2-stroke air cooled and 4-stroke water cooled cylinder liner (wet and dry), cylinder head, gaskets. Different cylinder arrangements. Cylinder wear. Forms of combustion chamber in petrol engine. Location of spark plug. Combustion chamber in Diesel engines. Turbulence in Combustion chambers.

UNIT3: Engines Details (continued)

(b) Piston-plain, split skirt, auto-thermic, cam-ground, Anodising and Tinning of piston, Piston clearance (c) Piston rings-different types (d) Piston pin; different methods of fitting piston pin (e) Valves: Poppet, Rotary, reed, Poppet Valve arrangement, Overhead and side valve operating mechanism. Valve clearance. Hydraulic tappet. Sodium cooled valves. Valve seat inserts (f) Connecting rod, Section of connecting rod. Bearing metal for big and small end of connecting rod (g) Crank shaft. Left hand, right hand crankshaft. Balancing of crank shaft (General idea about static and dynamic balancing, problems excluding). Main bearings. Crankshaft end play. Vibration damper. Flywheel (h) Camshaft, Camshaft drive timing gears (i) Inlet and exhaust manifold, Mufflers, Exhaust pipe (j) Variable Valve Timing (VVT).

UNIT4

(A) Rotary Engine. Principle and operation. Engine cooling. Advantages and limitations.
(B) Internal combustion Turbines. Principle of working, Classification, Brayton cycle. Cycle efficiency. Friction effect. Optimum compression ratio. Simple numerical problems, Deviation of practical cycles. Methods to improve efficiency, Turbine characteristics, combustion chamber, Fuel injection, Ignition Gas turbine Fuels, Materials. Turbine blades.

UNIT5

(A) Supercharging and scavenging. Necessity of supercharging, Rotary compressors, Turbocharger requirement, Effect of supercharging on power output, mechanical losses, fuel consumption, detonation, Limitations of supercharging. Methods and classification of scavenging process. Performance of different scavenging systems.
(B) Engine specifications, specifications of engines of Indian vehicles - four wheelers, three wheelers and two wheelers.

Reference Books:

1. Automotive Engines, A.K. Babu, Khanna Publishing House
2. Thermal Engineering I & II: Sarao, Gambhir & Aggarwal
3. Automobile Engineering II: Kirpal Singh
4. Basic Automobile Engineering: CP Nakra
5. Automobile Engineering: RB Gupta

Paper: Automobile Electrical Equipment
Code: BAS 304
Credits: 3

Course Contents:

Unit 1: Automobile Wiring Systems & Cables
Earth-return and insulated-return systems; 6 Volt, 12 Volt and 24 Volt systems. Positive and negative earthing. Cables-starting systems cables, general purpose cables and high tension cables; specifications and colour codes. Diagram of a typical wiring system. Wiring harness, cable connectors, circuit breakers, plastic fibre-optic wires, printed circuits. Fuses in circuits.

Unit 2: Storage Battery
Principle of lead-acid cells; constructional details of battery plates, separator, container, terminal, vent plug, grouping compound. Electrolyte: specific gravity of electrolyte and it variation with temperature. Effect of charging and discharging of specific gravity. Capacity of battery. Efficiency of battery. Methods of charging of battery. Internal circuit of battery charger. Care and maintenance of batteries. Checking for cell voltage and specific gravity of electrolyte. Battery tests- high discharge test, cranking motor test, open-circuit voltage test, cadmium test, life test. Battery failures, Maintenance-free batteries, VRLA batteries, Traction battery. Alkaline type batteries. Fuel cell and its types, Battery Life enhancer.

UNIT 3: Dynamo
Principle of generation of D.C. Constructional details of a Dynamo. Armature reaction. Principle of commutation. Construction of commutator. Types of wound field generator series, shunt and compound wound. Other types of D.C. generators-four brush & four pole, inter-pole, split field and bucking field. Dyna-Starter, Generator drive.

UNIT 4: Alternator
Principle of generation of A.C. Constructional details of an alternator. Working of alternators. Advantages over dynamo. Types of alternators. Charging of battery with an alternator. Regulator for alternators.

UNIT 5: Regulators
Constant current and constant voltage systems, Double-contact and compensated voltage control regulators. Current-and-voltage regulator, Cut-out

Reference Books:
1. Automotive Electricals and Electronics, A.K. Babu, Khanna Publishing House
2. Automotive Electrical Equipment: PL Kohli
3. Modern Electrical Equipment: AW Judge
4. Automotive Electrical Equipment: WH Crouse

Paper: Alternative Fuel & Emission Control
Code: BAS 305
Credits: 3

Course Contents:

Unit-I: Conventional Fuels and Need for alternative fuels: Estimate of petroleum reserve and availability - comparative properties of fuels- diesel and gasoline, quality rating of SI and CI engine fuels, fuel additives for SI and CI engines, thermodynamics of fuel combustion - introduction to chemical thermodynamics, chemical reaction - fuels and combustion, enthalpy of formation and enthalpy of combustion, first law analysis of reacting systems, adiabatic flame temperature, need for alternative fuels, applications, types etc.

Unit-II: Alternative Fuels: Gaseous Fuels and Bio-fuel: Introduction to CNG, LPG, ethanol, vegetable oils, bio-diesel, biogas, Hydrogen and HCNG. Study of availability, manufacture, properties, storage, handling and dispensing, safety aspects, engine/vehicle modifications required and effects of design parameters performance and durability Synthetic Fuels Introduction to Syngas, DME, P-Series, GTL, BTL, study of production, advantages, disadvantages, need, types, properties, storage and handling, dispensing and safety, discussion on air and water vehicles.

Unit–III: Emission Control (SI Engine): Emission formation in S.I. engines -Hydrocarbons, carbon monoxide, oxides of nitrogen, poly-nuclear aromatic hydrocarbon, effects of design and operating variables on emission formation in spark ignition engines, controlling of pollutant formation in engines exhaust after treatment, charcoal canister control for evaporative emission control, emissions and drivability, positive crank case ventilation system for un burnt HC emission reduction.

Unit-IV: Emission Measurement and Control (CI Engine): Chemical delay, intermediate compound formation, pollutant formation on incomplete combustion, effect of design and operating variables on pollutant formation, controlling of emissions, emissions and drivability, exhaust gas recirculation, exhaust after treatment – doc, dpf, scr and lnt. Measurement and test procedure (ndir analyzers, fid, chemiluminescence nox analyzer, oxygen analyzer, smoke measurement, constant volume sampling, particulate emission measurement, orsat apparatus.)

Unit-V: Health effects of Emissions from Automobiles: Emission effects on health and environment. Emission inventory, ambient air quality monitoring, Emission Norms: As per Bharat Standard up to BS – IV.

Reference Books:

1. Electric & Hybrid Vehicles, A.K. Babu, Khanna Publishing House

THIRD SEMESTER
PRACTICAL

Paper: IT Tools Lab
Code: BAS 391
Credits: 3

Course Contents:

- Spreadsheets, Word, Presentation
- Multimedia Design
- Troubleshooting
- Project / Practical File
- Viva Voce

Paper: Automobile Workshop-I
Code: BAS 392
Credits: 1.5

Course Contents:

UNIT-I: Engine tuning: Meaning and scope of engine tuning. Necessity of engine tuning, Service data of Maruti: Alto, Wagon R, Swift (Petrol & Diesel); Hyundai: Santro, Ford: Figo; Volkswagen: Polo; Chevrolet: Spark. Engine analysis and tuning with the help of diagnostic computer, Diesel engine injection timing checking

UNIT-II: Wheel Balance: Reasons of wheel imbalance, Effect of wheel imbalance on stability of vehicle. Static and dynamic balancing, Wheel balancing by the application of weights, Wheel Alignment: Meaning of wheel alignment, Various angles-camber, caster, KPI & toe - and their effect on steering stability, General values of popular Indian vehicles, Wheel alignment on computerized wheel aligner.

UNIT-III: Measurement of Exhaust Pollution by various analyzers such as Four Gas Analyzer, Smoke meter, Nox analyser

UNIT-IV: Use of Headlight aligner, Wheel aligner, wheel balancing, automotive oscilloscope

UNIT-V: Servicing: Meaning and scope of servicing, Items attended to in servicing of a vehicle. Servicing a vehicle, Focusing and alignment of head lights

Reference Books:
1. Engine Service: Gary Lewis
2. Various Car's Manuals