

AUTOMOBILE REPAIR AND SERVICE MANAGEMENT

ENAM 411

Lecture : 3
Tutorial : 0
Practical : 3/2

Year : IV
Part : I

Course Objectives:

The objective of this course is to equip knowledge and skills of internal combustion engine operations, specifically focusing on the transition from ideal to actual cycle processes and their quantitative analysis. This course deals with various engine performance characteristics to evaluate efficiency and power output under different operating conditions.

1 Introduction (6 hours)

- 1.1 Objectives and types of maintenance
- 1.2 Concept and purposes of repair
- 1.3 General categorization of repair types and their features
- 1.4 Advantages and limitations of repair and maintenance
- 1.5 Calculation of repair and maintenance costs

2 Wear and Repair of Vehicle Components (6 hours)

1

- 2.1 Natural and accidental wear, causes and factors affecting wear rate
- 2.2 Classifications of wear: Adhesive, oxidative, thermal, abrasive and pitting wear
- 2.3 Concept of repair or replace
- 2.4 Repairing methods and processes
 - 2.4.1 Welding and brazing: Arc and gas welding processes, equipment functions, torch brazing and flux applications
 - 2.4.2 Surface and material treatments: Soldering processes, metal spray (Gas wire process) and use of various fluxes
 - 2.4.3 Machining operations: Drilling, grinding, milling, turning, shaping, boring and honing

3 Measuring Instruments and Testing Equipment (10 hours)

2

- 3.1 Types and uses of Vernier calipers, micrometers, dial gauges and bore gauges
- 3.2 Fluid and pressure testing: Feeler gauges, plastic gauges, compression gauges, hydrometers and pressure gauges

- 3.3 Electronic and specialized diagnostics
 - 3.3.1 Diagnostic instrumentation: Multimeters, oscilloscopes, thermometers, vibration transducers, decibel meters, speedometers and tachometers
 - 3.3.2 System testing equipment: Engine scanners, analyzers, timing lights, injector testers and exhaust gas analyzers
 - 3.3.3 Performance and safety testing: Engine/chassis dynamometers, battery testers, FIP test benches, wheel balancers and alignment testers

4 Service Station Operations and Layout (8 hours)

3

- 4.1 Types and function of service stations
- 4.2 Area calculation and allocation for maintenance, repair and diagnostics
- 4.3 Workshop layout, calculation of working post areas and manpower requirements
- 4.4 Maintenance equipment: Washing machines, grease guns, spray guns, oil filter wrenches, air compressors and pneumatic tools
- 4.5 Technical service procedures
 - 4.5.1 Overhauling process of engine, gearbox and final drive
 - 4.5.2 Electrical and electronic system diagnosis
 - 4.5.3 EV testing and diagnosis systems
 - 4.5.4 Denting and painting processes

5 Hygiene and Safety (6 hours)

- 5.1 Health hazards and prevention
- 5.2 Sanitation, ventilation, heating systems and air conditioning
- 5.3 Identification and control of chemical hazards
- 5.4 Fire protection equipment and prevention of electrical accidents
- 5.5 Noise and air pollution, waste disposal and workshop-specific pollution prevention
- 5.6 Requirements for workshop equipment and operational safety standards

6 Workshop Management and Documentation (5 hours)

- 6.1 Pre-delivery inspection (PDI), job cards, billing, satisfaction vouchers, history cards and warranty policies
- 6.2 Workshop manuals, service documentation and customer complaint response strategies
- 6.3 Final delivery procedures of the vehicle to the owner after repair
- 6.4 Compliance of workshop with existing laws

7 Spare Parts and Inventory Management

(4 hours)

- 7.1 Inventory Control: Spare parts management, inventory cycles and stocking levels
- 7.2 Procurement of parts, tracking and organizational efficiency in an auto-workshop

Practical

(22.5 hours)

- 1. Engine systems maintenance and diagnostics
 - i. Perform engine compression tests and analyze results to diagnose internal health
 - ii. Cylinder bore measurement (Using dial bore gauges) and cylinder head inspection for warpage (facing)
 - iii. Valve seat lapping and adjustment of valve clearances
 - iv. Diagnosis and rectification of poor pickup, overheating and excessive oil/coolant consumption
- 2. Transmission and driveline service
 - i. Clutch maintenance: Adjustment of pedal free play and hydraulic system air bleeding
 - ii. Guided overhauling of a manual gearbox and differential backlash adjustment
 - iii. Maintenance of U-joints, propeller shafts and hub/axle bearings
- 3. Steering and suspension maintenance
 - i. Adjustment of steering free play and inspection of hydraulic fluid/lubrication levels
 - ii. Inspection and replacement of shock absorbers, leaf/coil springs and rubber bushings
 - iii. Wheel balancing and alignment testing procedures
- 4. Braking system service and repair
 - i. Brake fluid replacement, system air bleeding and inspection of lines for leakages
 - ii. Brake shoe/pad replacement and brake drum/disc inspection
- 5. Electrical, electronic and EV diagnostics
 - i. Testing of battery, alternator and ignition system components using multimeter
 - ii. Computerized Diagnostics using OBD-II engine scanners and analyzers to identify fault codes
 - iii. Safety procedures and basic diagnosis of Electric Vehicle (EV) battery and motor systems
- 6. Workshop management and service practices
 - i. Chassis and hub greasing; identification and rectification of fluid leakages
 - ii. Preparation of automotive job cards, PDI checklists and vehicle service history sheets
 - iii. Exhaust gas analysis and diagnosis for low fuel economy

7. Service station design and equipment practice
 - i. Assignment on designing an efficient workshop layout including working posts and tool allocation
 - ii. Practical use of air compressors, pneumatic tools, washing machines and FIP test benches

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapters	Hours	Marks distribution*
1	6	8
2	6	8
3	10	14
4	8	10
5	6	8
6, 7	9	12
Total	45	60

* There may be minor deviation in marks distribution.

References

1. Chhikara, A. (2014). Automobile engineering: Automobile chassis and systems (Vol. 2). Satya Prakashan.
2. Crouse, W. H. & Anglin, D. L. (2017). Automotive mechanics (10th ed.). McGraw Hill Education.
3. Giri, N. K. (2015). Automobile mechanics (10th ed.). Khanna Publishers.
4. Gupta, R. B. (2016). Automobile engineering. Satya Prakashan.
5. Heitner, J. (2006). Automobile mechanics: Principles and practices (2nd ed.). CBS Publishers & Distributors.
6. Srinivasan, S. (2003). Automotive mechanics (2nd ed.). Tata McGraw-Hill Education.