

# AUTO TECH: ENGINE REPAIR (180 Hours)

Course No.: 79-90-73

## COMPETENCY CHECKLIST

Student Name \_\_\_\_\_

Teacher Name \_\_\_\_\_ School Site \_\_\_\_\_

Start Date \_\_\_\_\_ Completion Date \_\_\_\_\_ Certificate Date \_\_\_\_\_

Teacher Signature \_\_\_\_\_ Student Signature \_\_\_\_\_

Signature verifies completion of course competencies)

### A. ORIENTATION AND SAFETY (5 hrs)

- \_\_\_\_\_ 1. Scope and purpose of the course
- \_\_\_\_\_ 2. Classroom policies and procedures
- \_\_\_\_\_ 3. Classroom/workplace emergency procedures
- \_\_\_\_\_ 4. Occupations w/impact on role of auto tech
- \_\_\_\_\_ 5. OSHA workplace requirements for auto tech
- \_\_\_\_\_ 6. EPA legislation on transportation industry
- \_\_\_\_\_ 7. ARB legislation on transportation industry
- \_\_\_\_\_ 8. BAR standards for safety & environmental
- \_\_\_\_\_ 9. MSDS as it applies to automotive industry
- \_\_\_\_\_ 10. Safety items required by fed/state/local
- \_\_\_\_\_ 11. NATEF in auto technician training
- \_\_\_\_\_ 12. Use of protective clothing and gloves
- \_\_\_\_\_ 13. Use of protective respiratory gear
- \_\_\_\_\_ 14. Use of protective eye gear
- \_\_\_\_\_ 15. Proper ventilation in an auto shop
- \_\_\_\_\_ 16. Handling, storage and disposal of chemicals
- \_\_\_\_\_ 17. Safety exam with 100% accuracy

### B. RESOURCE MANAGEMENT (1 hr)

- \_\_\_\_\_ 1. Define terms related to topic
- \_\_\_\_\_ 2. Management of resources in auto industry
- \_\_\_\_\_ 3. Examples of effective resource management
- \_\_\_\_\_ 4. Benefits of effective resource management
- \_\_\_\_\_ 5. Economic/environment benefits & liabilities

### C. TRADE MATHEMATICS (7 hrs)

- \_\_\_\_\_ 1. Application of math to auto maintenance
- \_\_\_\_\_ 2. Problem-solving with whole numbers
- \_\_\_\_\_ 3. Problem-solving with fractions
- \_\_\_\_\_ 4. Problem-solving with decimals
- \_\_\_\_\_ 5. Changing fractions to decimals
- \_\_\_\_\_ 6. Changing decimals to fractions
- \_\_\_\_\_ 7. English system of measuring length
- \_\_\_\_\_ 8. English system of measuring weight

- \_\_\_\_\_ 9. English system of measuring volume/capacity
- \_\_\_\_\_ 10. English system linear units of measurement
- \_\_\_\_\_ 11. English system units of volume & capacity
- \_\_\_\_\_ 12. Solve problems w/English system of measuring
- \_\_\_\_\_ 13. Use English measuring tools common to trade
- \_\_\_\_\_ 14. Metric system of measuring length
- \_\_\_\_\_ 15. Metric system of measuring weight
- \_\_\_\_\_ 16. Metric system of measuring volume/capacity
- \_\_\_\_\_ 17. Metric system linear units of measurement
- \_\_\_\_\_ 18. Metric system linear units of weight
- \_\_\_\_\_ 19. Solve problems with metric system measuring
- \_\_\_\_\_ 20. Use metric measuring tools common to trade
- \_\_\_\_\_ 21. Problem-solving with geometric problems
- \_\_\_\_\_ 22. Problem-solving with algebraic problems
- \_\_\_\_\_ 23. Problem-solving with percentages
- \_\_\_\_\_ 24. Reading & interpreting graphs
- \_\_\_\_\_ 25. Using a calculator

### D. TOOLS AND EQUIPMENT (7 hrs)

- \_\_\_\_\_ 1. Maintenance/storage of general hand tools
- \_\_\_\_\_ 2. Maintenance/storage of shop equipment
- \_\_\_\_\_ 3. Maintenance/storage specialty tools

### E. SERVICE MANUALS AND COMPUTER-BASED INFORMATION SYSTEMS (1 hr)

- \_\_\_\_\_ 1. Different types of service manuals
- \_\_\_\_\_ 2. Information found in service manuals
- \_\_\_\_\_ 3. Demonstrate the use of service manuals
- \_\_\_\_\_ 4. Demo use of CD/web search to find auto info
- \_\_\_\_\_ 5. CD/web search vs. service manuals

### F. ENGINES (4 hrs)

- \_\_\_\_\_ 1. Internal combustion process for gas & diesel
- \_\_\_\_\_ 2. Energy and work principles of auto engines
- \_\_\_\_\_ 3. Operation of the four-stroke cycle

- \_\_\_\_\_ 4. Operation of the two-stroke cycle
- \_\_\_\_\_ 5. Identify various engine components
- \_\_\_\_\_ 6. Engine types and configurations
- \_\_\_\_\_ 7. Function of crankshaft
- \_\_\_\_\_ 8. Function of connecting rod and piston
- \_\_\_\_\_ 9. Operation of lubrication system
- \_\_\_\_\_ 10. Function of crankshaft bearings
- \_\_\_\_\_ 11. Operation of camshaft
- \_\_\_\_\_ 12. Function of cylinder head and valves
- \_\_\_\_\_ 13. Importance of valve timing
- \_\_\_\_\_ 14. Engine maintenance
- \_\_\_\_\_ 15. Perform compression tests

**G. FUEL AND INDUCTION SYSTEMS (4 hrs)**

- \_\_\_\_\_ 1. Air pressure and vacuum
- \_\_\_\_\_ 2. Differences in automotive fuels
- \_\_\_\_\_ 3. Importance of air-fuel ratio
- \_\_\_\_\_ 4. Operation of fuel delivery system
- \_\_\_\_\_ 5. Components of the fuel delivery system
- \_\_\_\_\_ 6. Operation of carburetor
- \_\_\_\_\_ 7. Significance of combustion emissions
- \_\_\_\_\_ 8. Principles of emission controls
- \_\_\_\_\_ 9. Principles of fuel injection
- \_\_\_\_\_ 10. Operation of intake systems
- \_\_\_\_\_ 11. Operation of exhaust systems
- \_\_\_\_\_ 12. Principles of turbochargers & superchargers

**H. ELECTRICAL (4 hrs)**

- \_\_\_\_\_ 1. Electron flow theory
- \_\_\_\_\_ 2. Magnetic induction theory
- \_\_\_\_\_ 3. Operation of storage battery
- \_\_\_\_\_ 4. Operation of starting system
- \_\_\_\_\_ 5. Operation of charging system
- \_\_\_\_\_ 6. Operation of lighting & accessory systems

**I. IGNITION SYSTEM (4 hrs)**

- \_\_\_\_\_ 1. Operation of ignition systems
- \_\_\_\_\_ 2. Identify components of ignition system
- \_\_\_\_\_ 3. List components of the primary circuit
- \_\_\_\_\_ 4. Operation of primary circuit
- \_\_\_\_\_ 5. Components of the secondary circuit
- \_\_\_\_\_ 6. Operation of secondary circuit
- \_\_\_\_\_ 7. Operation of spark advance mechanisms
- \_\_\_\_\_ 8. Electronic ignition operation
- \_\_\_\_\_ 9. Electronic spark control
- \_\_\_\_\_ 10. Computer input/output operations
- \_\_\_\_\_ 11. Function of computer sensors
- \_\_\_\_\_ 12. Tune-up procedures

**J. HYBRID VEHICLES (2 hrs)**

- \_\_\_\_\_ 1. Describe HEVs
- \_\_\_\_\_ 2. Relationship of gas engine & electric motor

- \_\_\_\_\_ 3. Compare HEV and gas powered vehicle
- \_\_\_\_\_ 4. Technologies typically used by hybrids
- \_\_\_\_\_ 5. Optimum driving environment for an HEV

**K. ALTERNATIVE FUEL VEHICLES (2 hrs)**

- \_\_\_\_\_ 1. Concept of alternative fuel vehicles
- \_\_\_\_\_ 2. Examples of alternative fuel vehicles
- \_\_\_\_\_ 3. Compare alternative fuel to gas engine vehicle

**L. GENERAL ENGINE DIAGNOSIS; REMOVAL AND REINSTALLATION (30 hrs)**

- \_\_\_\_\_ 1. Complete work order with all information
- \_\_\_\_\_ 2. Identify engine concern and determine action
- \_\_\_\_\_ 3. Research applicable vehicle and service info
- \_\_\_\_\_ 4. Locate vehicle and component ID numbers
- \_\_\_\_\_ 5. Inspect engine for leaks and determine action
- \_\_\_\_\_ 6. Diagnose noises/vibrations & determine action
- \_\_\_\_\_ 7. Excessive fluid usage and determine action
- \_\_\_\_\_ 8. Engine vacuum tests and determine action
- \_\_\_\_\_ 9. Cylinder power balance test; determine action
- \_\_\_\_\_ 10. Cylinder cranking & running compression tests
- \_\_\_\_\_ 11. Cylinder leakage tests; determine action
- \_\_\_\_\_ 12. Remove/reinstall engine; restore to running
- \_\_\_\_\_ 13. Install engine covers: gaskets, seals, sealers
- \_\_\_\_\_ 14. Perform common fastener and thread repair
- \_\_\_\_\_ 15. Inspect, remove and replace engine mounts

**M. CYLINDER HEAD AND VALVE TRAIN DIAGNOSIS AND REPAIR (35 hrs)**

- \_\_\_\_\_ 1. Remove cylinder head/inspect/install
- \_\_\_\_\_ 2. Inspect a cylinder head for cracks
- \_\_\_\_\_ 3. Inspect valve springs; squareness & free height
- \_\_\_\_\_ 4. Replace valve stem seals on an engine
- \_\_\_\_\_ 5. Inspect valve guides for wear/check clearance
- \_\_\_\_\_ 6. Inspect valves and valve seats
- \_\_\_\_\_ 7. Check valve spring & valve stem height
- \_\_\_\_\_ 8. Inspect pushrods, rocker arms, pivots, shafts
- \_\_\_\_\_ 9. Inspect valve lifters
- \_\_\_\_\_ 10. Adjust valves: mechanical & hydraulic lifters
- \_\_\_\_\_ 11. Inspect & replace camshaft & drive belt/chain
- \_\_\_\_\_ 12. Inspect/measure camshaft for runout/wear
- \_\_\_\_\_ 13. Inspect camshaft for wear and damage
- \_\_\_\_\_ 14. Establish camshaft position sensor indexing

**N. ENGINE BLOCK ASSEMBLY DIAGNOSIS AND REPAIR (35 hrs)**

- \_\_\_\_\_ 1. Disassemble engine block; clean and inspect
- \_\_\_\_\_ 2. Inspect engine block for wear and damage
- \_\_\_\_\_ 3. Inspect/measure cylinder walls/sleeves
- \_\_\_\_\_ 4. Deglaze and clean cylinder walls
- \_\_\_\_\_ 5. Inspect/measure camshaft for wear/damage

- \_\_\_\_\_ 6. Inspect crankshaft for wear and damage
- \_\_\_\_\_ 7. Inspect main and connecting rod bearings
- \_\_\_\_\_ 8. Identify piston and bearing wear patterns
- \_\_\_\_\_ 9. Inspect/measure piston skirts & ring lands
- \_\_\_\_\_ 10. Remove and replace piston pin
- \_\_\_\_\_ 11. Determine piston-to-bore clearance
- \_\_\_\_\_ 12. Inspect/measure/install piston rings
- \_\_\_\_\_ 13. Inspect auxiliary shaft(s) & support bearings
- \_\_\_\_\_ 14. Remove/inspect crankshaft vibration damper
- \_\_\_\_\_ 15. Assemble engine block.

**O. LUBRICATION AND COOLING SYSTEMS**

**DIAGNOSIS AND REPAIR (35 hrs)**

- \_\_\_\_\_ 1. Perform oil pressure tests
- \_\_\_\_\_ 2. Inspect oil pump gears/components
- \_\_\_\_\_ 3. Perform cooling system pressure tests
- \_\_\_\_\_ 4. Inspect/replace/adjust: drive belts/pulleys
- \_\_\_\_\_ 5. Inspect/replace cooling/heater system hoses
- \_\_\_\_\_ 6. Inspect/test/replace thermostat, gasket/seal
- \_\_\_\_\_ 7. Test coolant; drain and recover; flush & refill
- \_\_\_\_\_ 8. Inspect/remove/replace water pump
- \_\_\_\_\_ 9. Remove and replace radiator
- \_\_\_\_\_ 10. Inspect & test fan(s) and fan components
- \_\_\_\_\_ 11. Inspect auxiliary coolers
- \_\_\_\_\_ 12. Test/replace oil temperature switches/sensors
- \_\_\_\_\_ 13. Perform oil and filter change
- \_\_\_\_\_ 14. Identify causes of engine overheating

**P. EMPLOYABILITY SKILLS (3 hrs)**

- \_\_\_\_\_ 1. Employer requirements in employee
- \_\_\_\_\_ 2. Potential employers thru internet sources
- \_\_\_\_\_ 3. Design sample resumes
- \_\_\_\_\_ 4. Filling out job application legibly, accurately
- \_\_\_\_\_ 5. Complete sample job application forms
- \_\_\_\_\_ 6. Importance of enthusiasm on a job
- \_\_\_\_\_ 7. Importance of appearance on a job
- \_\_\_\_\_ 8. Continuous upgrading of job skills
- \_\_\_\_\_ 9. Customer service to build business

**Q. ENTREPRENEURIAL SKILLS (1 hr)**

- \_\_\_\_\_ 1. Define entrepreneurship
- \_\_\_\_\_ 2. Characteristics of successful entrepreneurs
- \_\_\_\_\_ 3. Contributions to auto repair industry
- \_\_\_\_\_ 4. Purpose and components of a business plan
- \_\_\_\_\_ 5. Personal goals prior to starting a business
- \_\_\_\_\_ 6. Sources of investment to business
- \_\_\_\_\_ 7. Licensing needs for auto repair business
- \_\_\_\_\_ 8. Scenario of student as business owner
- \_\_\_\_\_ 9. Green vs. standard business practices