Wayne County Community College District

COURSE SYLLABUS

AUT 118 Engine Performance I

CREDIT HOURS: 3.00

CONTACT HOURS: 60.00

COURSE DESCRIPTION:
This introductory course is designed to help the student identify engine and computer control systems on the modern automobile. Basic troubleshooting procedures will be used to diagnose the engines electrical, ignition, fuel and emissions systems. Other areas such as ASE certification techniques will also be introduced in this course.

PREREQUISITES: *AUT 114, AUT 115, AUT 116, AUT 117*

EXPECTED COMPETENCIES:
Upon successful completion of this course, the student will be able to:
Industry Information

- **Identify various career types in the automotive field**
  Objective
  - Identify the eight Automotive Service Excellence (ASE) service areas for technicians and the components included in each.
  - Identify career opportunities directly related to the automotive technology field.
  - Identify various methods used to pay automotive technicians.
  - Identify the difference between a union and a non-union shop.

Shop Safety

For every task in Engine Performance, the following safety requirements must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

- **Identify protective clothing and equipment and their proper use; proper shop behavior; principles of fire safety; and federal regulations concerning hazardous material and shop safety.**
  Objective
  - Describe how to select individual personal protective clothing and equipment.
  - Identify the dangers of improper behavior in the shop.
  - Identify the importance of proper grooming and hygiene.
  - Identify the classes of fires and the types of fire extinguishers.
  - Identify the use of a fire blanket.
  - Identify general fire emergency procedures.
  - Identify the Occupational Safety and Health Administration (OSHA) regulations.
  - Identify the Environmental Protection Agency (EPA) regulations.
  - Identify the safe use of fire protection equipment
  - Identify the safe use of shop equipment following Environmental Protection Agency (EPA) and Occupational Safety and Health Act (OSHA) regulations

- **Identify and explain the safe and proper use of chemicals**
  Objective
  - Identify the types and uses of solvents.
  - Identify the types and uses of soaps and cleaning solutions.
  - Identify the types and uses of oils.
  - Identify the types and uses of greases.
  - Identify the types and uses of specialty additives.
  - Identify the types and uses of specialty chemicals.
  - Describe the five general rules for using automotive chemicals.
  - Complete the assignment sheet on lubricants.
  - Complete the assignment sheet on lubricants.
  - Identify gasses and the hazards they present.
  - Identify the hazards of asbestos dust.

- **Identify and explain the safe and proper use of basic hand tools**
  Objective
  - Identify the types and uses of common end wrenches.
  - Identify the types and uses of socket set components.
  - Identify the types and uses of wrenches.
  - Identify the types and uses of screwdrivers.
  - Identify the types and uses of pliers.
  - Identify the types and uses of hammers.
  - Identify the types and uses of punches and chisels.

- **Identify and explain the safe and proper use of specialty tools, fasteners, and measuring tools**
  - Identify the types and uses of specialty tools.
  - Describe the procedures for cutting threads onto a rod or into a hole, repairing damaged threads, and removing broken bolts.
  - Identify common nuts and bolts in the English system.
  - Identify common nuts and bolts in the metric system.
  - Identify other types of common fasteners.
  - Identify the types and uses of measuring tools.
  - Identify the procedures for the care and use of measuring tools.

- **Identify and explain the safe and proper use of power tools and shop equipment**
  - Identify the types and uses of pneumatic, hydraulic, and electric power tools.
  - Identify the hazards of power tools.
  - Identify the types, purposes, and safety considerations of common shop equipment.
  - Demonstrate the ability to:
    A. Lift a vehicle

General Engine Diagnosis

- **Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1**
  Objective
  - Identify terms and definitions associated with the evaluation and diagnosis of engine performance problems
  - Identify important diagnostic information included in driver complaints

- **Identify and interpret engine performance concern; determine necessary action. P-1**
  Objectives
  - Identify the procedures for verifying the customer's concerns.

- **Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins. P-1**
  Objectives
  - Identify printed and electronic resources for automotive manuals, manufacturer and supplier updates.

- **Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals). P-1**
  Objectives
  - Identify locations where vehicle identification numbers are found

- **Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-2**
  Objectives
  - Identify the procedures for performing a visual engine inspection
  - Identify the procedures for inspecting the engine exhaust.
  - Demonstrate the ability to:
    A. Perform a preliminary visual engine system inspection

- **Diagnose abnormal engine noise or vibration concerns; determine necessary action. P-2**
  Objectives
  - Identify the procedures for performing a visual engine inspection
  - Identify the procedures for inspecting the engine exhaust
  - Demonstrate the ability to:
    A. Perform a preliminary visual engine system inspection

- **Diagnose abnormal exhaust color, odor, and sound; determine necessary action. P-2**
  Objectives
  - Identify the procedures for performing a visual engine inspection
  - Identify the procedures for inspecting the engine exhaust
  - Identify the basics of the inspection and maintenance 240 second test
  - Identify the procedures for testing the exhaust gases using an exhaust gas analyzer
  - Demonstrate the ability to:
    A. Perform a preliminary visual engine system inspection .
    B. Diagnose driveability concerns using an exhaust gas analyzer

- **Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. P-1**
  Objectives
  - Identify the procedures for diagnosing engine condition and performance using engine vacuum gauge tests
  - Identify the procedures for diagnosing engine condition and performance using a cranking engine compression test
  - Identify the procedures for diagnosing engine condition and performance using a running engine compression test
  - Identify the procedures for diagnosing engine condition and performance using a cylinder leakage test
  - Identify the procedures for diagnosing engine condition and performance using a cylinder balance test
  - Demonstrate the ability to:
    A. Perform engine vacuum gauge tests.
    B. Perform a cranking engine compression test with the throttle closed
    C. Perform a cranking engine compression test with the throttle open
    D. Perform a running engine compression test
    E. Perform a cylinder leakage test.
    F. Perform a cylinder balance test.

- **Perform cylinder power balance test; determine necessary action. P-1**
  Objectives
  - Identify the procedures for diagnosing engine condition and performance using engine vacuum gauge tests.
  - Identify the procedures for diagnosing engine condition and performance using a cranking engine compression test.
  - Identify the procedures for diagnosing engine condition and performance using a running engine compression test.
  - Identify the procedures for diagnosing engine condition and performance using a cylinder leakage test.
  - Identify the procedures for diagnosing engine condition and performance using a cylinder balance test.
  - Demonstrate the ability to:
    A. Perform engine vacuum gauge tests.
    B. Perform a cranking engine compression test with the throttle closed.
    C. Perform a cranking engine compression test with the throttle open
    D. Perform a running engine compression test.
    E. Perform a cylinder leakage test.
    F. Perform a cylinder balance test.

- **Perform cylinder cranking compression tests; determine necessary action. P-1**
  Objectives
  - Identify the procedures for diagnosing engine condition and performance using engine vacuum gauge tests.
  - Identify the procedures for diagnosing engine condition and performance using a cranking engine compression test.
  - Identify the procedures for diagnosing engine condition and performance using a running engine compression test.
  - Identify the procedures for diagnosing engine condition and performance using a cylinder leakage test.
  - Identify the procedures for diagnosing engine condition and performance using a cylinder balance test.
  - Demonstrate the ability to:
    A. Perform engine vacuum gauge tests
    B. Perform a cranking engine compression test with the throttle closed
    C. Perform a cranking engine compression test with the throttle open
    D. Perform a running engine compression test
    E. Perform a cylinder leakage test.
    F Perform a cylinder balance test.

- **Perform engine running compression test; determine necessary action. P-2**
  Objectives
  - Identify the procedures for diagnosing engine condition and performance using engine vacuum gauge tests.
  - Identify the procedures for diagnosing engine condition and performance using a cranking engine compression test.
  - Identify the procedures for diagnosing engine condition and performance using a running engine compression test.
  - Identify the procedures for diagnosing engine condition and performance using a cylinder leakage test.
  - Identify the procedures for diagnosing engine condition and performance using a cylinder balance test.
  - Demonstrate the ability to:
    A. Perform engine vacuum gauge tests
    B. Perform a cranking engine compression test with the throttle closed
    C. Perform a cranking engine compression test with the throttle open
    D. Perform a running engine compression test
    E. Perform a cylinder leakage test.
    F Perform a cylinder balance test.

- **Perform cylinder leakage test; determine necessary action. P-1**
  Objectives
  - Identify the procedures for diagnosing engine condition and performance using engine vacuum gauge tests.
  - Identify the procedures for diagnosing engine condition and performance using a cranking engine compression test.
  - Identify the procedures for diagnosing engine condition and performance using a running engine compression test.
  - Identify the procedures for diagnosing engine condition and performance using a cylinder leakage test.
  - Identify the procedures for diagnosing engine condition and performance using a cylinder balance test.
  - Demonstrate the ability to:
    A. Perform engine vacuum gauge tests.
    B. Perform a cranking engine compression test with the throttle closed
    C. Perform a cranking engine compression test with the throttle open
    D. Perform a running engine compression test
    E. Perform a cylinder leakage test.
    F. Perform a cylinder balance test.

- **Verify engine operating temperature; determine necessary action. P-1**
  Objectives
  - Identify the procedures for verifying engine operating temperature.
  - Identify the procedures for inspecting, testing, and servicing the cooling system.
  - Identify the procedures for draining, flushing, and filling the cooling system.
  - Identify the procedures for inspecting, testing, and servicing the thermostat and components.
  - Identify the procedures for inspecting, testing, and servicing the fan and fan components.
  - Demonstrate the ability to:
    A. Verify engine operating temperature.
    B. Inspect, test, and service the cooling system.
    C. Drain, flush, and fill the cooling system.
    D. Inspect, test, and service the thermostat and components.
    E. Inspect, test, and service the fan and fan components.

- **Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action. P-1**
  Objectives
  - Identify the procedures for inspecting, testing, and servicing the cooling system.
  - Identify the procedures for draining, flushing, and filling the cooling system.
  - Demonstrate the ability to:
    A. Inspect, test, and service the cooling system.
    B. Drain, flush, and fill the cooling system.

- **Verify correct camshaft timing. P-2**
  Objectives
  - Identify the procedures for verifying camshaft timing.
  - Demonstrate the ability to:
    A. Verify camshaft timing.

Emissions Control Systems Diagnosis and Repair
Positive Crankcase Ventilation

- **Diagnose oil leaks, emissions, and driveability problems resulting from malfunctions in the positive crankcase ventilation (PCV) system; determine necessary action. P-2**
  Objectives
  - Identify the purpose of the emission control system.
  - Identify the basic operation of the positive crankcase ventilation system
  - Identify the construction of the positive crankcase ventilation system
  - Identify the operation of the valve.
  - Identify the basics of the positive crankcase ventilation orifice system
  - Complete the assignment sheet on the positive crankcase ventilation system.
  - Identify the procedures for inspecting the positive crankcase ventilation system.
  - Identify the procedures for testing the positive crankcase ventilation system using an exhaust gas analyzer.
  - Identify the procedures for servicing the positive crankcase ventilation system.
  - Demonstrate the ability to:
    A. Diagnose and service the positive crankcase ventilation system

- **Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2**
  Objectives
  - Identify the purpose of the emission control system.
  - Identify the basic operation of the positive crankcase ventilation system
  - Identify the construction of the positive crankcase ventilation system
  - Identify the operation of the valve
  - Identify the basics of the positive crankcase ventilation orifice system
  - Complete the assignment sheet on the positive crankcase ventilation system
  - Identify the procedures for inspecting the positive crankcase ventilation system
  - Identify the procedures for testing the positive crankcase ventilation system using an exhaust gas analyzer
  - Identify the procedures for servicing the positive crankcase ventilation system.
  - Demonstrate the ability to:
    A. Diagnose and service the positive crankcase ventilation system

Engine Related Service

- **Adjust valves on engines with mechanical or hydraulic lifters. P-1**
  Objectives
  - Identify the procedures for adjusting the valves on engines with mechanical or hydraulic lifters.
  - Demonstrate the ability to:
    A. Adjust the valves on engines with mechanical or hydraulic lifters

- **Remove and replace timing belt; verify correct camshaft timing. P-1**
  Objectives
  - Identify the procedures for verifying camshaft timing.
  - Demonstrate the ability to:
    A. Verify camshaft timing.
- **Remove and replace thermostat and gasket. P-1**
  Objectives
  - Identify the procedures for adjusting the valves on engines with mechanical or hydraulic lifters.
  - Identify the procedures for verifying camshaft timing.
  - Identify the procedures for verifying engine operating temperature.
  - Identify the procedures for inspecting, testing, and servicing the cooling system.
  - Identify the procedures for draining, flushing, and filling the cooling system.
  - Identify the procedures for inspecting, testing, and servicing the thermostat and components.
  - Identify the procedures for inspecting, testing, and servicing the fan and fan components.
  - Demonstrate the ability to:
    A. Verify engine operating temperature.
    B. Inspect, test, and service the cooling system.
    C. Drain, flush, and fill the cooling system.
    D. Inspect, test, and service the thermostat and components.
    E. Inspect, test, and service the fan and fan components.
- **Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action. P-1**
  Objectives
  - Identify the procedures for adjusting the valves on engines with mechanical or hydraulic lifters.
  - Identify the procedures for verifying camshaft timing.
  - Identify the procedures for verifying engine operating temperature.
  - Identify the procedures for inspecting, testing, and servicing the cooling system.
  - Identify the procedures for draining, flushing, and filling the cooling system.
  - Identify the procedures for inspecting, testing, and servicing the thermostat and components.
  - Identify the procedures for inspecting, testing, and servicing the fan and fan components.
  - Demonstrate the ability to:
    A. Adjust the valves on engines with mechanical or hydraulic lifters.
    B. Verify camshaft timing.
    C. Verify engine operating temperature.
    D. Inspect, test, and service the cooling system.
    E. Drain, flush, and fill the cooling system.
    F. Inspect, test, and service the thermostat and components.
    G. Inspect, test, and service the fan and fan components.

- **Perform common fastener and thread repair to include; remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. P-1**
  Objectives
  - Identify terms and definitions associated with internal combustion engine construction and operation.
  - Identify the components of a typical internal combustion engine.
  - Identify basic types of engines.
  - Identify the terms and definitions associated with engine disassembly and inspection
  - Identify the procedures for the short block assembly
- **Perform oil and filter change. P-1**
  Objective
  - Identify terms and definitions associated with internal combustion engine construction and operation.
  - Identify the components of a typical internal combustion engine.
  - Identify the operation of the four-stroke-cycle internal combustion engine.
  - Identify basic types of engines.
  - Identify the terms and definitions associated with lubricating system construction, inspection, and repair
  - Identify lubricating system components
  - Identify the procedures for inspecting and repairing the oil system
  - Identify the procedures for diagnosing problems with the lubricating system
- **Demonstrate proficiency in using Oxy-Acetylene torch to heat and cut metal. P-3**
  Objective
  - Describe how to select individual personal protective clothing and equipment.
  - Identify the dangers of improper behavior in the shop.
  - Identify the importance of proper grooming and hygiene.
  - Identify the classes of fires and the types of fire extinguishers.
  - Identify the use of a fire blanket.
  - Identify general fire emergency procedures.
  - Identify the Occupational Safety and Health Administration (OSHA) regulations.
  - Identify the Environmental Protection Agency (EPA) regulations.
  - Identify the safe use of fire protection equipment
  - Identify the safe use of shop equipment following Environmental Protection Agency (EPA) and Occupational Safety and Health Act (OSHA) regulations
- **Identify hybrid vehicle internal combustion engine service precautions. P-3**
  Objective
  - Identify terms and definitions associated with internal combustion/hybrid engine construction and operation.
  - Identify the components of a typical internal combustion/hybrid engine.
  - Identify basic types of engines.
  - Identify the terms and definitions associated with engine disassembly and inspection

ASSESSMENT METHODS:

Student performance may be assessed by examination, quizzes, case studies, oral conversation, group discussion, oral presentations. The instructor reserves the option to employ one or more of these assessment methods during the course.

GRADING SCALE:

90%-100% = A
80%-89.9%= B
70%-79.9%= C
60%-69.9%= D
<60% = E