



# Wayne County Community College District

## COURSE SYLLABUS

### AUT 151 Light Duty Diesel Engines

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**CREDIT HOURS:** 4.00

**CONTACT HOURS:** 60.00

**COURSE DESCRIPTION:**

This course covers the operation of light duty diesel engines. Students will diagnosis and repair mechanical and electronic fuel injection systems, air induction and exhaust systems, and perform general engine diagnosis according to the engine manufacturer standards.

**PREREQUISITES:** AUT 117 Electrical/Electronics Systems IV

**EXPECTED COMPETENCIES:**

Upon successful completion of the this course, the successful 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 Light Duty Diesel Engines, 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



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- **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**

***Objective***

- 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**

***Objective***

- 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

Based on established engine manufacturer standards the successful student will be able to:

***General Engine Diagnosis***



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### **Objective**

- Inspect fuel, oil and coolant levels and condition; determine needed repairs.
- Diagnose causes of engine fuel, oil, coolant and other leaks; determine needed repairs.
- 3. Interpret engine noises; determine needed repairs.
- Observe engine exhaust smoke color and quantity; determine needed repairs.
- Perform air intake system restriction and leakage tests; determine needed repairs.
- Perform intake manifold pressure (boost) test; determine needed repairs.
- Perform exhaust back pressure test; determine needed repairs.
- Perform crankcase pressure test; determine needed repairs.
- Diagnose no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed repairs.
- Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed repairs.
- Diagnose engine vibration problems; determine needed repairs.
- Check, record, and clear electronic diagnostic codes; monitor electronic data; determine needed repairs.

### **Diesel Engines**

#### **Objective**

- Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed repairs.
- Adjust valve clearance.
- Remove, inspect, service, and install pans, covers, vents, gaskets, seals, and wear rings.
- Test engine oil pressure and check operation of pressure sensor, gauge and/or sending unit; determine needed repair.
- Check engine oil level and condition; determine needed repairs.
- Inspect, clean and test oil cooler and components; determine needed repairs.
- Inspect turbocharger lubrication system; determine needed repairs.
- Determine proper lubricant and perform an oil and filter change.
- Check engine coolant level, condition, and consumption; determine needed repairs.
- Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed repairs.
- Inspect drive belts, tensioners, and pulleys; replace as needed.
- Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
- Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
- Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines and fittings; repair as needed.
- Inspect water pump, hoses, and idler pulley; replace as needed.
- Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed repairs.
- Inspect thermostatic cooling fan system and fan shroud; replace as needed.



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### ***Air Induction and Exhaust Systems Diagnosis and Repair***

#### ***Objective***

- Inspect turbocharger, wastegate, and piping systems; determine needed repair.
- Test operation of exhaust-mounted engine warm up device; determine needed repairs.
- Inspect, clean, and test aftercooler (intercooler) and charge air cooler assemblies; repair as needed.
- Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed. Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed repairs.

### ***Fuel Supply System Diagnosis and Repair***

#### ***Objective***

- Check fuel level and quality; determine needed repairs.
- Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed repairs.
- Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed repairs.
- Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed repairs.
- Check fuel system for air; determine needed repairs; prime and bleed fuel system; check primer pump.

### ***Mechanical Fuel Injection Diagnosis and Repair***

#### ***Objective***

- Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time a distributor (rotary) type injection pump; determine needed repairs.
- Perform on-engine inspections, tests, and adjustments; check and adjust timing or replace and time an in-line injection pump; determine needed repairs.
- Perform on-engine inspections, tests, and adjustments; replace a PT-type injection pump and injectors as needed.
- Inspect and adjust throttle control linkage; determine needed repairs.
- Inspect air/fuel ratio control systems; determine needed action.
- Inspect, test and adjust fuel shut-down devices and controls; determine needed repairs.
- Inspect high pressure injection lines, hold downs, fittings and seals; replace as needed.



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### ***Electronic Fuel Management System Diagnosis and Repair***

#### **Objective**

- Inspect and test power a ground circuits and connections; determine needed repairs.
- Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software and/or data scan tools); determine needed action.
- Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
- Inspect and replace electrical connector terminals, seals, and locks.
- Inspect and test sensors, controls, actuator components, and circuits; adjust or replace as needed.
- Access and change customer parameters using recommended electronic diagnostic tools (to include PC based software and/or data scan tools).
- Inspect, test, and adjust electronic unit injectors (EUI); determine needed repairs.
- Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
- Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
- Perform engine timing sensor calibration (if applicable).
- Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed repairs.
- Perform on-engine inspections and tests on hydraulic electronic unit injector (HEUI) high pressure oil control system; determine needed repairs.
- Perform on-engine inspections and tests on distributor-type injection pump electronic controls; determine needed repairs.
- Perform on-engine inspections and tests on in-line injection pump electronic controls; determine needed repairs.

#### **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