STRANDS AND STANDARDS

ASE DIESEL ENGINES

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CTE®

Course Description

This course is a follow up course to the Diesel IMMR and is in a sequence that prepares individuals to apply technical knowledge and skills to the specialized maintenance and repair of trucks, buses, and other commercial and industrial vehicles. Instruction covers training in the following areas: diesel engine repair. Work ethics and productivity are an integral part of the classroom and lab activities of these courses.

Intended Grade Level	10-12
Units of Credit	1.0
Core Code	
Concurrent Enrollment Core Code	
Prerequisite	Diesel IMMR
Skill Certification Test Number	
Test Weight	
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Diesel Technician
Endorsement 2	
Endorsement 3	

STRAND 1

Student will participate in personal and leadership development activities through SkillsUSA or another appropriate career and technical student organization.

Standard 1

Student will use communication skills to effectively communicate with others.

- Understand when it is appropriate to listen and to speak.
- Understand and follow verbal and written instructions for classroom and laboratory activities.

Standard 2

Student will effectively use teamwork to respectfully work with others.

- Identify and understand different roles in working with a team.

Standard 3

Student will use critical thinking and problem-solving skills.

- Analyze the cause of the problem.
- Develop a solution to address the problem.
- Implement the plan.
- Evaluate the effectiveness of the plan.

Standard 4

Student will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior.

- Set and meet goals on attendance and punctuality.
- Prioritize, plan, and manage work to complete assignments and projects on time.

Standard 5

Student will be accountable for results.

- Use an achievement chart for activities and behaviors in class that encourages a personal evaluation of classroom performance.
- File a regular written report on progress toward completion of assignments and projects.

Standard 6

Be familiar with the legal requirements and expectations of the course.

- Be familiar with the course disclosure statement and all requirements for successful completion of the course.
- Demonstrate workplace ethics, e.g. fair, honest, disciplined.

STRAND 2

Student will participate in work-place readiness activities.

Standard 1

Student will demonstrate employability skills.

- Use a career search network to find career choices.
- Write a resume including a list of demonstrated skills.
- Write a letter of application.

- Complete a job application.
- Participate in an actual or simulated job interview.

Standard 2

Student will participate in a work-based learning experience outside the classroom.

- Student will plan and implement a work-based learning experience aligned with their career goal.

STRAND 3

Students will understand general shop safety.

Standard 1

Learn safe working habits and procedures. Pass a safety test with 100 percent.

Standard 2

Review the different types and hazards of solvents used.

Standard 3

Review the different types, purposes, and hazards of automotive greases, oils, and additives.

Standard 4

Review precautions in the use, handling, and storage of various solvents, cleaners, oils, greases, and additives.

Standard 5

Review the gasses encountered in the diesel field and the hazards they present.

Standard 6

Review the hazards and control of asbestos dust.

Standard 7

Comply with safety rules for working with automotive chemicals (SDS).

Performance Skills

- Pass safety test with 100%

STRAND 4

Students will inspect the Diesel Engine in General and determine needed repair.

Standard 1

Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.

Standard 2

Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant.

Standard 3

Inspect engine assembly for fuel, oil, coolant, air, and other leaks; determine needed action.

Standard 4

Diagnose engine operation (starting and running) including: noise, vibration, smoke, etc.; determine needed action.

Standard 5

Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.

Standard 6

Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking.

Standard 7

Diagnose engine no-crank, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.

Standard 8

Diagnose engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and/or shut down problems; determine needed action.

Performance Skills

- Research vehicle service information.
- Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant.
- Inspect engine assembly for fuel, oil, coolant, air, and other leaks; determine needed action.
- Diagnose engine operation (starting and running) including: noise, vibration, smoke, etc.
- Use appropriate electronic service tool(s) and procedures to diagnose problems.
- Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking.
- Diagnose engine no-crank, cranks but fails to start, hard starting, and starts but does not continue to run problems.
- Diagnose engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and/or shut down problems.

STRAND 5

Students will inspect the Cylinder Head and Valve Train.

Standard 1

Inspect electronic wiring harness and brackets for wear, bending, cracks, and proper securement; determine needed action.

Standard 2

Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.

Standard 3

Inspect injector sleeves and seals; determine needed action.

Standard 4

Inspect valve train components; determine needed action.

Standard 5

Inspect, measure, and replace/reinstall camshaft; measure/adjust end play and backlash.

Standard 6

Adjust valve bridges (crossheads); adjust valve clearances and injector settings.

Standard 7

Disassemble cylinder head; inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.

Standard 8

Measure valve head height relative to deck; measure valve face-to-seat contact; determine needed action.

Standard 9

Reassemble cylinder head.

Standard 10

Inspect, measure, and replace/reinstall camshaft; measure end play and backlash; determine needed action.

Performance Skills

- Inspect electronic wiring harness and brackets.
- Inspect cylinder head for cracks/damage.
- Inspect injector sleeves and seals.
- Inspect valve train components.
- Inspect, measure, and replace/reinstall camshaft.
- Adjust valve bridges (crossheads); adjust valve clearances and injector settings.
- Disassemble cylinder head; inspect valves, guides, seats, springs, retainers, rotators, locks, and seals.
- Measure valve head height relative to deck; measure valve face-to-seat contact
- Reassemble cylinder head.
- Inspect, measure, and replace/reinstall camshaft.

STRAND 6

Students will inspect Engine Block.

Standard 1

Inspect crankshaft vibration damper; inspect engine mounts; determine needed action.

Standard 2

Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components; determine needed action.

Standard 3

Perform crankcase pressure test; determine needed action.

Standard 4

Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s); and measure flywheel housing face and bore runout; determine needed action.

Standard 5

Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.

Standard 6

Disassemble and clean engine block; inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion plugs, and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.

Standard 7

Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action.

Standard 8

Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.

Standard 9

Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).

Standard 10

Inspect camshaft bearings for wear and damage; determine needed action.

Standard 11

Inspect, measure, and replace/reinstall camshaft; measure end play and backlash; determine needed action.

Standard 12

Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.

Standard 13

Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.

Standard 14

Inspect, install, and time gear train; measure gear backlash; determine needed action.

Standard 15

Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; determine needed action.

Standard 16

Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons

Standard 17

Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.

Standard 18

Check condition of piston cooling jets (nozzles); determine needed action.

Performance Skills

- Inspect crankshaft vibration damper; inspect engine mounts.
- Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
- Perform crankcase pressure test.
- Install and align flywheel housing.
- Inspect flywheel/flexplate (including ring gear) and mounting surfaces.
- Disassemble and clean engine block.
- Inspect cylinder sleeve counter bore and lower bore.
- Clean, inspect, and measure cylinder walls or liners for wear and damage.
- Replace/reinstall cylinder liners and seals.
- Inspect camshaft bearings for wear and damage.
- Inspect, measure, and replace/reinstall camshaft.
- Clean and inspect crankshaft for surface cracks and journal damage.
- Inspect main bearings for wear patterns and damage.
- Inspect, install, and time gear train; measure gear backlash.
- Inspect connecting rod and bearings for wear patterns; measure.
- Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap.
- Assemble pistons and connecting rods; install in block.
- Check condition of piston cooling jets (nozzles).

STRAND 7

Students will inspect the Lubrication Systems.

Standard 1

Test engine oil pressure; check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature; check operation of temperature sensor; determine needed action.

Standard 2

Check engine oil level, condition, and consumption; take engine oil sample; determine needed action.

Standard 3

Determine proper lubricant; perform oil and filter service.

Standard 4

Inspect, clean, and test oil cooler and components; determine needed action.

Standard 5

Inspect turbocharger lubrication systems; determine needed action.

Standard 6

Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.

Standard 7

Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.

Performance Skills

- Test engine oil pressure.
- Check engine oil level, condition, and consumption.
- Determine proper lubricant; perform oil and filter service.
- Inspect, clean, and test oil cooler and components.
- Inspect turbocharger lubrication systems.
- Inspect and measure oil pump, drives, inlet pipes, and pick-up screens.
- Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters.

STRAND 8

Students will inspect the Cooling System.

Standard 1

Check engine coolant type, level, and condition; test coolant for freeze protection and additive package concentration.

Standard 2

Test coolant temperature; test operation of temperature and level sensors, gauge, and/or sending unit; determine needed action.

Standard 3

Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.

Standard 4

Recover coolant; flush and refill with recommended coolant/additive package; bleed cooling system.

Standard 5

Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.

Standard 6

Inspect water pump, hoses, and clamps; determine needed action.

Standard 7

Inspect and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings; determine needed action.

Standard 8

Inspect, test, and repair thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; determine needed action.

Standard 9

Test engine block heater(s); determine needed action.

Standard 10

Diagnose engine coolant consumption; determine needed action.

Standard 11

Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.

Standard 12

Inspect turbocharger cooling systems; determine needed action.

Performance Skills

- Check engine coolant type, level, and condition.
- Test coolant temperature; test operation of temperature and level sensors, gauge, and/or sending unit.
- Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
- Recover coolant; flush and refill with recommended coolant/additive package; bleed cooling system.
- Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings.
- Inspect water pump, hoses, and clamps.
- Inspect and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings.
- Inspect, test, and repair thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud.
- Test engine block heater(s).
- Diagnose engine coolant consumption.
- Inspect thermostat(s), by-passes, housing(s), and seals.
- Inspect turbocharger cooling systems.

STRAND 9

Students will inspect the Air Induction and Exhaust Systems

Standard 1

Inspect turbocharger(s), wastegate(s), and piping systems; determine needed action

Standard 2

Diagnose air induction system problems; inspect, clean, and/or replace cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable).

Standard 3

Inspect intake manifold, gaskets, and connections; determine needed action.

Standard 4

Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust aftertreatment system for leaks, mounting, proper routing, and damaged or missing components; determine needed action.

Standard 5

Inspect crankcase ventilation system; service as needed.

Standard 6

Diagnose problems/faults in the exhaust gas recirculation (EGR) system including: EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.

Standard 7

Perform air intake system restriction and leakage tests; determine needed action.

Standard 8

Perform intake manifold pressure (boost) test; determine needed action.

Standard 9

Check exhaust back pressure; determine needed action.

Standard 10

Inspect variable ratio geometry turbocharger (VGT), controls, and actuators (pneumatic, hydraulic, and electronic); determine needed action

Standard 11

Demonstrate knowledge of charge air cooler operation and testing.

Standard 12

Diagnose exhaust aftertreatment system performance problems; determine needed action.

Standard 13

Diagnose preheater/inlet air heater or glow plug system and controls: determine needed action.

Performance Skills

- Inspect turbocharger(s), wastegate(s), and piping systems.
- Diagnose air induction system problems.
- Inspect intake manifold, gaskets, and connections.
- Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust aftertreatment system for leaks, mounting, proper routing, and damaged or missing components.
- Inspect crankcase ventilation system.
- Diagnose problems/faults in the exhaust gas recirculation (EGR) system.
- Perform air intake system restriction and leakage tests.
- Perform intake manifold pressure (boost) test.
- Check exhaust back pressure.
- Inspect variable ratio geometry turbocharger (VGT), controls, and actuators (pneumatic, hydraulic, and electronic).
- Demonstrate knowledge of charge air cooler operation and testing.
- Diagnose exhaust aftertreatment system performance problems.
- Diagnose preheater/inlet air heater or glow plug system and controls.

STRAND 10

Students will inspect the Fuel System.

Standard 1

Check fuel level and condition; determine needed action.

Standard 2

Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings; determine needed action

Standard 3

Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware); determine needed action.

Standard 4

Replace fuel filter; prime and bleed fuel system.

Standard 5

Inspect high pressure fuel system components (fuel pump, pump drives, hoses, injection lines, filters, hold-downs, fittings, seals, and mounting hardware).

Standard 6

Demonstrate knowledge and understanding of the different types of fuel systems.

Standard 7

Perform fuel supply and return system tests; determine needed action

Standard 8

Perform cylinder contribution test using electronic service tool(s).

Standard 9

Demonstrate knowledge of how to set performance parameters using electronic service tools and service information system access.

Performance Skills

- Check fuel level and condition.
- Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings.
- Inspect low pressure fuel system components.
- Replace fuel filter; prime and bleed fuel system.
- Inspect high pressure fuel system components.
- Demonstrate knowledge and understanding of the different types of fuel systems.
- Perform fuel supply and return system tests.
- Perform cylinder contribution test using electronic service tool(s).
- Demonstrate knowledge of how to set performance parameters using electronic service tools and service information system access.

STRAND 11

Students will inspect the Fuel System.

Standard 1

Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings; determine needed action.

Standard 2

Inspect and adjust engine compression and/or exhaust brake systems; determine needed action.

Standard 3

Inspect, test, and adjust engine compression and/or exhaust brake control circuits, switches, and solenoids; determine needed action.

Performance Skills

- Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings.
- Inspect and adjust engine compression and/or exhaust brake systems.
- Inspect, test, and adjust engine compression and/or exhaust brake control circuits, switches, and solenoids.