

DIESEL TECHNOLOGY SYLLABUS

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COURSE DESCRIPTION:	<ul style="list-style-type: none"> • This course is designed to give students knowledge to gain employment at local businesses in the surrounding community. Also this course will provide students with the knowledge to continue their education. • Students will learn the theory of heavy duty diesel engine rebuilding • Students will learn the theory of electricity and electronics used on heavy duty diesel engines • Students will learn the theory of heavy duty brakes • Students will develop organizational skills • Students will improve communication skills • Students will improve research skills
COURSE GOALS & OBJECTIVES:	<p>Introduction to Medium & Heavy Trucks</p> <p>Week 1 & 2 - Introduction</p> <ol style="list-style-type: none"> 1. Identify and describe career opportunities in the truck service industry 2. Describe typical Medium & Heavy Truck gaskets, seals, bearings, belts and hoses 3. Identify and describe the purpose of typical truck stop tools and equipment, fasteners, lines, fittings, and belts. 4. Identify and describe typical Medium & Heavy Truck Gaskets, seals, bearings and hoses. 5. Define and discuss fuels 6. Identify and describe typical Medium & Heavy Truck gaskets, seals, bearings, belts and hoses. 7. Identify truck by classification. 8. Perform minor service procedures 9. Use and maintain hand tools 10. Demonstrate use of precision measuring tools 11. Use and install fasteners 12. Use and maintain power tools 13. Apply basic math skills 14. Demonstrate use of technical manuals, specification handbooks and charts. <p>Electrical</p> <p>Week 3 & 4 – General Electrical Systems Diagnosis</p> <ol style="list-style-type: none"> 1. Read, interpret and diagnose electrical/electronic circuits using wiring diagrams 2. Check continuity in electrical/electronic circuits using appropriate test equipment 3. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using a digital multimeter 4. Check current flow in electrical/electronic circuits and components using a digital multimeter or a clamp-on ammeter. 5. Check resistance in electrical/electronic circuits and components using a digital multimeter 6. Find shorts, grounds, and opens in electrical/electronic circuits 7. Diagnosis parasitic (key-off) battery drain problems. 8. Inspect and test fusible links, circuit breakers, relays solenoids, and fuses; replace as needed. 9. Inspect and test spike suppression diodes/resistors; replace as needed. <p>Week 5 – Battery Diagnosis and Repair</p> <ol style="list-style-type: none"> 1. Perform battery load test; determine needed action 2. Determine battery state of charge using an open circuit voltage test 3. Inspect clean, and service battery; replace as needed

4. Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.
5. Charge battery using slow or fast charge method as appropriate.
6. Inspect test, and clean batter cables and connectors; repair or replace as needed.
7. Jump start a vehicle using jumper cables and a booster battery or auxiliary power supply using proper safety procedures

Week 6 & 8 – Starting System Diagnosis and Repair

1. Perform starter current draw test; determine needed action
2. Perform starter circuit cranking voltage and voltage drop tests; determine needed action.
3. Inspect test, and replace components (key switch, push button and/or magnetic switch) and wires in the starter control circuit.
4. Inspect, test, and replace starter relays and solenoids/switches
5. Remove and replace starter; inspect flywheel ring gear or flow plate

Week 7 - Charging System Diagnosis and Repair

1. Diagnose instrument panel mounted volt meters and/or indicator lamps that show a no charge, low charge, or overcharge condition to determine needed action.
2. Diagnose the cause of a no charge, low charge, or over charge condition; determine the needed action.
3. Inspect, adjust, and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets.
4. Perform charging system voltage and amperage output test; determine needed action.
5. Perform charge in circuit voltage drop tests; determine needed action.
6. Remove and replace alternator
7. Inspect repair, or replace connectors and wires in the charging circuit.
8. Diagnose AC voltage leakage (failed rectifier) at alternator output; determine needed action

Week 9 & 10 - Lighting Diagnosis and Repair Headlights, Daytime Running Lights, Parking, Clearance, Tail, Cab & Instrumental Panel Lights

1. Diagnose instrument panel mounted volt meters and/or indicator lamps that show a no charge, or over charge condition; determine needed action
2. Diagnose the cause of a no charge, low charge, or overcharge condition; determine the needed action
3. Inspect, adjust, and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets
4. Perform charging system voltage and amperage output test; determine needed action
5. Perform charging circuit voltage drop tests; determine needed action
6. Remove and replace alternator
7. Inspect, repair, or replace connectors and wires in the charging circuit

Week 11 - Stoplights, Turn Signals, Hazard Lights, and Back Up Lights

1. Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, and wires; repair or replace as needed.
2. Inspect and test turn signal and hazard circuit flashers, switches, relays, bulbs/LEDs, sockets, connectors, terminals, and wires; repair or replace as needed.
3. Inspect, test and adjust backup lights and warning device circuit switches, blubs/LEDs, sockets, horns, buzzers, connectors, terminals, and wires; repair or replace as needed.

Week 12 - Gauges and Warning Devices Diagnosis and Repair

1. Interface with vehicles on board computer; perform diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action.
2. Diagnose the cause of intermittent, high, low, or no gauge readings; determine the needed action.
3. Diagnose the cause of data bus driven gauge malfunctions; determine needed action.

4. Inspect and test gauge circuit sending units, gauges, connector, terminals and wires; repair or replace as needed.
5. Inspect and test warning devices (lights and audible) circuit sending units, bulbs/LEDs, sockets, connector's wires, and printed circuits/control modules; repair or replace as needed.
6. Inspect, test, replace, and calibrate (if applicable) electronics speedometer, odometer, and tachometer systems.

Week 13, 14 & 15 - Related Electrical Systems

1. Diagnose the cause on constant, intermittent, or no horn operation; determine needed action.
2. Inspect and test horns circuit relays, horns, switches, connectors, and wires; repair or replace as needed.
3. Diagnose the cause of constant, intermittent, or no wiper problems, determine needed action
4. Inspect and test wiper motor, resistors, park switches, connectors, and wires; repair or replace as needed.
5. Inspect wiper motor transmission linkage, arms and blades, adjust or replace as needed.
6. Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, and wires; repair or replace as needed.
7. Inspect and test side view mirror motors, heater circuit grids, relays, switches, connectors, terminals, and wires; repairs or replace as needed.
8. Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, terminals and wires; repair or replace as needed.
9. Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, and wires; repair or replace as needed.
10. Diagnose the cause of slow, intermittent, or no power side window operation; determine needed action.
11. Inspect and test motors, switches, relays, connectors, terminals, and wires of power side window circuits, repair or replace as needed.
12. Inspect block heaters; determine needed repairs.
13. Inspect and test cruise control electrical components; repair or replace as needed.
14. Inspect and test engine cooling fan electrical control components; repair or replace as needed

DIESEL ENGINES

Week 16 & 17 - General Engine Diagnosis

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

Week 18 & 19 - Cylinder Head and Valve Train Diagnosis & Repair

1. Remove, clean, inspect for visible damage, and replace cylinder heads assembly.
2. Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.

3. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core and gallery plugs; determine needed action
4. Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks and seals; determine needed action.
5. Measure valve head height to deck, valve fact to seat contact, and valve seat concentricity
6. Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; perform needed action.
7. Inspect and adjust valve bridges (crossheads) and guides; perform needed action.
8. Reassemble cylinder head
9. Inspect measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.
10. Inspect pushrods, rocker arms, rocker arm shafts, electronic wiring harness, and brackets for wear, bending, cracks, looseness, and blocked oil passages; perform needed action.
11. Inspect cam followers; perform needed action
12. Adjust valve clearance.

Week 20, 21 & 22 - Engine Block Diagnosis and Repair

1. Remove, inspect service and install pans, covers, vents, gaskets, seals, and wear rings.
2. Disassemble, clean, and inspect engine block for cracks/damage, measure mating surfaces for warpage condition of passages, core and gallery.
3. Inspect cylinder sleeve counter bore and lower bore; check bore distortion; determine needed action.
4. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.
5. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion)
6. Inspect in-block camshaft bearings for wear and damage; determine needed action
7. Inspect in block camshaft bearings for wear and damage; determine needed action
8. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passage plugs; measure journal diameter, determine needed action
9. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and adjust crankshaft end play.
10. Inspect, install, and time gear train; measure gear backlash; determine needed action
11. Inspect connecting rod and bearings for wear patterns; measure piston, pins, retainers, and bushings; perform needed actions.
12. Determine piston-to-cylinder wall clearance; check ring-to-groove clearance and end gap; install rings on pistons.
13. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances
14. Check condition of piston cooling jets (nozzles); determine needed action.
15. Inspect and measure crankshaft vibration damper determine needed action.
16. Inspect install, and align flywheel housing
17. Inspect flywheel/flex plate (including ring gear) and mounting surfaces for cracks and wear, measure run out.

Week 23 & 24 - Lubrication Systems Diagnosis and Repair

1. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; determined needed action.
2. Check engine oil level and condition; determine needed action.
3. Inspect and measure oil pump, drives, inlet pipes, and pick up screens; determine needed action.
4. Inspect clean, and test oil cooler and components; determine needed action.
5. Inspect turbocharger lubrication system; determine needed action.
6. Determine proper lubricant and perform oil and filter change.
7. Determine proper lubricant and perform oil and filter change.

Week 25 & 26 - Cooling System Diagnosis and Repair

1. Check engine coolant level, condition, and consumption; determine needed action.
2. Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action.
3. Inspect drive belts, tensioners and pulley; replace and adjust as needed.
4. Inspect thermostats, by passes, housing, and seals; replace as needed.
5. Test coolant for freeze protection and additive package concentration; adjust as needed.
6. Recover, flush and refill with recommended coolant/additive package; bleed cooling system.
7. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines and fittings; replace as needed.
8. Inspect water pump, hoses, and idler pulley; replace as needed.
9. Inspect, clean, and pressure test radiator, pressure cap, tanks, and recovery systems; determine needed action.
10. Inspect thermostatic cooling fan system and fan shroud; replace as needed.

Week 27 & 28 - Air Induction and Exhaust Systems Diagnosis and Repair.

1. Inspect turbocharger, wastegate, and piping systems, determine action needed.
2. Test operation of exhaust mounted engine warm up device; determine needed action.
3. Remove and reinstall turbocharger and wastegate.
4. Inspect intake manifold, gaskets, and connections, replace as needed.
5. Inspect, clean, and test aftercooler (intercooler) and charge air cooler assemblies; replace as needed.
6. Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
7. Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.

Week 29 - Fuel System Diagnosis and Repair; Fuel Supply System Diagnosis and Repair

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

Week 30 - Fuel System Diagnosis and Repair

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

Week 31, 32 & 33 - Electronic Fuel Management System Diagnosis and Repair

1. Inspect and test power and ground circuits and connections; determine action needed
2. Interface with vehicles on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software
3. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).

4. Inspect and replace electrical connector terminals, seals, and locks.
5. Inspect and test sensors, controls, actuator components, and circuits; adjust or replace as needed.
6. Using recommended electronic diagnostic tools (to include PC based software/or data scan tools) access and change customer parameters.
7. Inspect, test, and adjust electronic unit injectors (EUI): determine needed action.
8. Remove and install electronic unit injectors (EUI) and related components , recalibrate ECM (if applicable)
9. Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
10. Perform engine timing sensor calibration (if applicable).
11. Perform on-engine inspections and tests on hydraulic electronic unit injectors (HEUI) and system electronic controls; determine needed action.
12. Perform on-engine inspections and tests on hydraulic electronic unit injector (HEIU) high pressure oil control system; determine needed action.
13. Perform on-engine inspections and tests on distributor-type injection pump electronic controls; determine needed action.
14. Perform on-engine inspections and test on in-line type injection pump electronic controls; determine needed action.

Week 34 - Engine Brakes

1. Inspect and adjust engine/exhaust brakes; determine needed action.
2. Inspect engine/exhaust brake housing, valves, seals, screens, lines, and fittings; repair or replace as needed.

Week 35,36,37 & 38 - Air Brakes and Diagnosis Repair

1. Diagnosis poor stopping, air leaks, premature wear, pulling, grabbing, or dragging problems caused by supply and service system malfunctions; determine needed action.
2. Check air system build-up, time determine needed action.
3. Drain air reservoir tanks, check for oil, water, and foreign material; determine needed action.
4. Inspect adjust and align compressor drive belts, pulleys, and tensioners; replace as needed.
5. Inspect compressor drive gear and coupling; replace as needed.
6. Inspect air compressor, air cleaner supply; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.
7. Inspect and test system pressure controls; governor, unloader assembly valves, intake screens, filters, lines, hoses, and fittings; replace as needed.
8. Inspect air system lines, hoses, fittings and couplings; repair or replace as needed.
9. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check-valves
10. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors, repair or replace as needed.
11. Inspect and test brake application (foot) valve, fittings, and mounts; adjust ore replace as needed.
12. Inspect and test stop light circuit switches, wiring and connectors; repair or replace as needed.
13. Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.
14. Inspect and test brake relay valve; replace as needed.
15. Inspect and test quick release valves; replace as needed.
16. Inspect and test front and rear axle limiting (proportioning) valves; replace as needed.
17. Inspect and test tractor protection valve; replace as needed.
18. Inspect and test emergency (spring) brake control valves replace as needed.
19. Inspect and test inversion valve; replace as needed.
20. Inspect and test low pressure warning devices, wiring and connectors, replace as needed. Inspect and test air pressure gauges, lines, and fittings, replace as needed.

Week 39 - Mechanical/Foundation

1. Diagnose poor stopping, brake noise, premature wear, pulling, grabbing or dragging problems cause by the foundation brake, slack adjuster, and brake chamber problems; determine needed action.
2. Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.
3. Inspect and service manual and automatic slack adjuster; perform needed action.
4. Inspect and replace camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor spins and springs
5. Inspect wedge brake spider, manual and automatic adjuster plungers, housing and wedge assembly; repair as needed.
6. Inspect clean, and adjust air disc brake caliper, assemblies, determine needed repairs.
7. Inspect and measure brake shoes, linings, or pads; perform needed action.
8. Inspect and measure brake drum of rotors; perform needed action.

Week 40 - Parking Brakes

1. Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.
2. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
3. Inspect and test parking (spring) brake application and release valve; replace as needed.
4. Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers recommendations.

Week 41 & 42 - Brakes: Hydraulic Brakes Diagnosis and Repair, Hydraulic System

1. Diagnosis poor stopping, premature wear, pulling, dragging or pedal feel problems caused by the hydraulic system; determine needed action.
2. Check and adjust brake pedal pushrod length.
3. Inspect and test matter cylinder for leaks and damage; replace as needed.
4. Inspect for leaks and damage, brake lines, flexible hoses, and fittings; replace as needed.
5. Inspect and test metering (hold off) load sensing/ proportioning, proportioning, and combination valves; replace as needed.
6. Inspect and test brake pressure differential valve and warning light circuit switch, bulbs, wiring, and connectors; repair or replace as needed.
7. Inspect wheel cylinders; replace as needed.
8. Inspect disc brake caliper assemblies, replace as needed.
9. Inspect/Test brake fluid-bleed and /or flush system; determine proper fluid type.
10. Test and adjust brake stop light switch, bulbs, wiring, and connectors; repair or replace as needed.

Week 43 - Mechanical/Foundation

1. Diagnose poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems; determine needed action.
2. Inspect and measure brake drums or rotors; perform needed action.
3. Inspect and measure disc brake pads/linings; inspect mounting hardware; perform needed action.

Week 44 - Power Assist Units

1. Diagnose poor stopping problems caused by the brake assist (booster) system; determine needed action.
2. Inspect test repair, or replace power brake assist (booster), hoses, and control valves; determine proper fluid type.
3. Check emergency (back-up, reserve) brake assist system.

Week 45 - Air & Hydraulic Antilock Brake Systems (ABS) and Automatic Traction Control (TAC)

1. Observe antilock brake (ABS) warning light operation; determine needed action.

2. Diagnose antilock brake system (ABS) electronic controls and components using self-diagnosis and/or test equipment (scan tool, PC computer): determine needed action.
3. Diagnose poor stopping and wheel lock-up caused by failure of the antilock brake system (ABS) determine needed action.
4. Inspect, test, and replace antilock brake system (ABS) air, hydraulic electrical and mechanical components; perform needed action.
5. Diagnose, service, and adjust antilock brake system (ABS) wheel speed sensors and circuits following manufacturers recommended procedures (including voltage output, resistance, shorts to voltage/ground, and frequency data)
6. Bleed and ABS hydraulic circuits following manufacturer's procedures
7. Observe automatic traction control (ATC) warning light operation; determine needed action.
8. Diagnose automatic traction control (ATC) electronic controls

ATTENDANCE POLICY AND GRADE REDUCTION

The Tuscola Technology Center places a high priority on attendance because the attendance pattern established by the student in school often sets an attendance pattern for employment. To benefit from the primary purpose of the school experience, it is essential that each student maintain regular and punctual attendance. Class attendance is necessary for learning and academic achievement as well as for developing the habits of punctuality, dependability, and self-discipline demanded by business and industry. Regular attendance in the Technology Center's labs is essential to allow students to fully participate in class instruction, discussion and skill development. Absences beyond eight days per semester are considered excessive. Both excused and unexcused absences are charged in the student total.

Absences beyond eight (8) per semester are considered excessive. At nine (9) absences, excused or unexcused, the student's grade will drop 1 full letter grade. At absence 11, 13, 15, grades will drop one full letter grade for each of those absences. Any grade reduction may be appealed to the Tech Center Administration in writing within two weeks of the end of the semester. The student may have an opportunity to make up the work, with credit, at the convenience of the instructor with the approval of administration.

STUDENT ASSESSMENT

Students will earn a grade for each marking period in the course. The grade will be comprised of 60% projects, 10% quizzes, and 30% work habits. Students will be assessed with written and computer based tests and hands-on performance testing.

A	100	93
A-	92.99	90
B+	89.99	87
B	86.99	83
B-	82.99	80
C+	79.99	77
C	76.99	73
C-	72.99	70
D+	69.99	67
D	66.99	63
D-	62.99	60
E	59.99	0

CERTIFICATE REQUIREMENTS CERTIFICATIONS

Students attending the DIESEL TECHNOLOGY Program have the opportunity to receive several highly recognized certifications. The National test in Outdoor Power Equipment is offered to students as well as the following:

- State Of Michigan Certification (Manual Transmission & Drive Axles, Engine, Light to Heavy Truck and Motorcycle Repair)
- Auto Service Excellence Certification (Gas & Diesel and Engine & Transmission)
- ALLDATA Software

**ARTICULATED
CREDIT**

One of the ways the Tuscola Technology Center is able to help students make the successful transition from high school to college is by offering articulated college credit. The technical skills and knowledge a student learns can save tuition fees shorten the time a student spends in college and reduces the duplication of courses at the college level. To receive articulated credit a student needs good grades, good attendance and be able to demonstrate that they have the maturity to bypass the college level courses. Students have the opportunity to earn college credit with several Michigan College. Colleges participating in the articulation include: Ferris State University, Delta College, and Northwestern University (Ohio).

Colleges to continue DIESEL TECHNOLOGY Training include: Delta College, Ferris State University, Henry Ford Community College, Kirtland Community College, Lansing Community College, Lincoln Technical Institute, Michigan State University, Mott Community College, Nashville Auto Diesel, Northern Michigan University, Northwestern Business Diesel College (Ohio), Saginaw Valley State University, University of Michigan, Washtenaw Community College.

**PROGRAM
SUPPLIES**

None

The instructor reserves the right to make adjustments to this syllabus as needed.