WHITEWATER CAREER CENTER
CULINARY ARTS

Scope and Sequence
Curriculum Outline

Career Program: Diesel Technology I
DOE Code: 5620
Career Cluster: Transportation
Recommended Grade Levels: 11, 12
Prerequisites: None
High School Credits: 3 per semester (6 total per school year)
Additional Information: Counts as a Directed Elective or Elective for the General, Core 40, Academic Honors and Technical Honors diplomas

Program Description: The program is designed to provide hands-on training related to modern diesel engines in tractor trailers, electric generators, farm and construction equipment, and diesel-fueled cars and trucks. Students learn engine operating principles and theories as well as diesel-fuel systems. Topics covered include inspection, troubleshooting, overhaul, and engine replacement procedures. The typical school day is divided between classroom and laboratory experiences concerned with all phases of repair work. Instruction and practice is provided in the diagnostics and repair of engines. The use of technical manuals, hand and power tools, and testing and diagnostic equipment is also studied in the program.

Alignment: Indiana Department of Education Academic Standards Course Framework, NATEF (National Automotive Technicians Education Foundation) program accreditation standards, ASE (National Institute for Automotive Service Excellence) student certification, Vincennes University (dual credit agreement), and *Diesel Technology* (Goodheart-Willcox) textbook materials.

Companion Documents: WCC Diesel Technology I Program Syllabus; WCC High School Pathway Plan; WCC Program Description Guide

Curriculum Content Summary:

- Workplace Competency
- Career Development
- Engines
- Systems
- Fluids

Content	Indiana DOE Standards	Knowledge & Skills *(based on ASE/NATEF)*	Example Activities	Time Frame	Evaluation / Certification
DOMAIN Workplace Competency **Core Standard I** Students develop employability skills to be successful in placement of a postsecondary institution and/or career related area	**DSTI-1.1** Allocate the appropriate resources for task completion **DSTI-1.2** Demonstrate effective interpersonal skills **DSTI-1.3** Develop leadership skills **DSTI-1.4** Establish positive relationships with people from diverse backgrounds **DSTI-1.5** Research, analyze, and use data for work assignments **DSTI-1.6** Apply effective critical thinking, decision making, and problem-solving techniques **DSTI-1.7** Select and use appropriate tools and technology **DSTI-1.8** Implement quality assurance measures and safeguards **DSTI-1.9** Read and interpret written materials **DSTI-1.10** Apply written communication skills **DSTI-1.11** Demonstrate effective listening and speaking skills **DSTI-1.12** Perform appropriate mathematical calculations correctly **DSTI-1.13** Exhibit a responsible work ethic **DSTI-1.14** Demonstrate accepted standards for ethical behavior **DSTI-1.15** Practice safe working procedures during each stage of diagnosis and repair **DSTI-1.16** Organize, research, and implement a complete preventive maintenance and inspection (P.M.I.)	• Reports to work daily on time; able to take directions and is motivated to accomplish tasks • Demonstrates honesty, integrity and reliability • Contributes to the success of the team, assists others and requests help when needed • Works well with all customers and coworkers • Negotiates solutions to interpersonal and workplace conflicts • Contributes ideas and initiative • Communicates (written and verbal) effectively with customers and coworkers • Reads and interprets workplace documents; writes clearly and concisely • Analyzes and resolves problems that arise in completing assigned tasks • Organizes and implements a productive work plan • Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks • Identifies and addresses the needs of all customers, providing helpful, courteous and knowledgeable service and advice as needed • Utilize safe procedures for handling of tools and equipment • Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment • Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities • Identify and wear appropriate clothing for lab/shop activities • Locate and demonstrate knowledge of material safety data sheets (SDS) • Demonstrate proper cleaning, storage, and maintenance of tools and equipment • Identify information needed and the service requested on a repair order • Review vehicle service history • Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction	• Work in a live shop environment on a daily basis • Teamwork to diagnose and perform repair equipment • Team leadership to diagnose and repair equipment • Research service procedures in AllData and Mitchell Truck Pro Series databases • Tool and equipment demonstrations • Parts identification • Complete work Orders/Job Sheets • Safety lessons and demonstrations • SkillsUSA membership • Skill competitions • Student Ambassadors • NTHS	2 weeks to introduce Reinforced throughout the year	• Chapter tests • Participation/Lab performance • Work Ethic Certification • Essential Skills Evaluation • Technical Skills Evaluation • Classroom work • Weekly participation

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DOMAIN Career Development **Core Standard 2** Students construct personal goals to structure successful paths recognized by business and industry	**DSTI-2.1** Establish a personal career goal and develop objectives for achieving the goal **DSTI-2.2** Evaluate employment and career pathway opportunities related to established career interest(s) **DSTI-2.3** Create a continuing education plan that identifies further education and training options **DSTI-2.4** Prepare for exams leading to certifications recognized by business and industry **DSTI-2.5** Develop skills needed to enter the workforce **DSTI-2.6** Evaluate resources that keep workers current in the career field **DSTI-2.7** Demonstrate skills and attitudes needed for lifelong learning **DSTI-2.8** Apply effective money management strategies	• Creates a resume for entry level work • Completes mock interviews with industry representatives • Prepares for certification exams • Demonstrates skills needed for employment and lifelong learning	• Resumes • Co-op opportunities for some students • Field trips to Caterpillar and Cummins • Company speakers • Postsecondary speakers • SkillsUSA membership • Skill competitions • Student Ambassadors • NTHS	2 weeks to introduce Reinforced throughout the year	• ASE certifications • Cummins certifications • Participation/Lab performance • Work Ethic Certification • Essential Skills Evaluation • Technical Skills Evaluation • Weekly participation • Classroom work

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DOMAIN Engines **Core Standard 3** Students analyze diesel engine operations to diagnose and repair malfunctions	**DSTI-3.1** Analyze the fundamentals of a diesel engine **DSTI-3.2** Perform engine assembly and disassembly procedures **DSTI-3.3** Diagnose engine performance **DSTI-3.4** Identify tools and equipment used in engine service **DSTI-3.5** Adjust or measure valve and engine brake clearance **DSTI-3.6** Utilize scan tools for engine service **DSTI-3.7** Identify new emission controls and serviceability **DSTI-3.8** Perform injector replacement procedures **DSTI-3.9** Diagnose drivability concerns **DSTI-3.10** Demonstrate proper shop safety practices while servicing engines	• Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action • Check engine no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems • Identify engine surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems • Check and record electronic diagnostic codes • Inspect valve train components • Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness • Perform crankcase pressure test • Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment • Inspect, clean, and pressure test radiator. Pressure test cap, tank(s), and recovery systems • Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed • Perform air intake system restriction and leakage tests • Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter as needed • Check fuel level, and condition • Perform fuel supply and return system tests • Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings • Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware • Inspect and test pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings) • Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump • Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM)	• Engine component demonstrations • Parts identification • Training engine tear down and reassembly • Engine testing • Component measurement and testing, such as crankshafts, connecting rods, and pistons • Valve adjustment procedures • Cylinder head torque procedures • Piston installation • Diagnosis with computerized diagnostic systems • Diagnosis of pre-programmed faults • Customer diagnosis and repair work	14 weeks to introduce Reinforced throughout the year	• ASE certifications • Cummins certifications • Parts identification test • Engine assembly procedure test • Component measurement test • Participation/Lab performance • Chapter tests • Lab based performance tests • Technical Skills Evaluation • Weekly participation • Classroom work • Dual credit

		• Interface with vehicle's on-board computer; perform diagnostic procedures using electronic service tool(s) (to include PC based software and/or data scan tools) • Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes • 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 switches, sensors, controls, actuator components, and circuits; adjust or replace as needed • Using electronic service tool(s) access and interpret customer programmable parameters • Perform cylinder contribution test utilizing electronic service tool(s)			

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DOMAIN Systems **Core Standard 4** Students examine various system to diagnose and repair malfunctions	**DSTI-4.1** Diagnose and repair fuel systems **DSTI-4.2** Evaluate and repair electrical/electronic systems **DSTI-4.3** Diagnose and repair lubrication systems **DSTI-4.4** Analyze and repair heating/cooling system **DSTI-4.5** Assess and repair intake and exhaust systems **DSTI-4.6** Perform preventative maintenance to the fuel system and lubricating system **DSTI-4.7** Service the cold starting aid system	• Listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action • Read and interpret electrical/electronic circuits using wiring diagrams • Check continuity in electrical/electronic circuits using appropriate test equipment • Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment • Check current flow in electrical/electronic circuits and components using appropriate test equipment • Check resistance in electrical/electronic circuits and components using appropriate test equipment • Locate shorts, grounds, and opens in electrical/electronic circuits • Identify parasitic (key-off) battery drain problems; perform tests • Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed • Identify battery type; perform appropriate battery load test • Determine battery state of charge using an open circuit voltage test • Inspect, clean, and service battery; replace as needed • Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed • Charge battery using appropriate method for battery type • Inspect, test, and clean battery cables and connectors; repair or replace as needed • Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures • Perform starter circuit cranking voltage and voltage drop tests • Inspect and test, starter relays and solenoids/switches; replace as needed • Remove and replace starter; inspect flywheel ring gear or flex plate • Test instrument panel mounted volt meters and/or indicator lamps	• Computerized diagnostic equipment testing • Temperature tests on cylinder outlets • Clutch adjustments • Drive train diagnosis • AC system service and repair • Parts/component identification • Component demonstrations • Systems testing • Engine management system diagnosis • Disassembly of wheels, brake drums, & brake shoes and reassembly and adjustment of brakes • Trainer truck lab work • Customer diagnosis and repair work	9 weeks to introduce Reinforced throughout the year	• ASE certifications • Cummins certifications • Participation/Lab performance • Chapter tests • Lab based performance tests • Technical Skills Evaluation • Weekly participation • Classroom work • Dual credit

		• Identify causes of a no charge, low charge, or overcharge problems; determine needed action. • Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment • Perform charging system voltage and amperage output tests; perform AC ripple test • Perform charging circuit voltage drop tests • Remove and replace alternator • Inspect, repair, or replace cables, wires, and connectors in the charging circuit • Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools)			

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DOMAIN Fluids **Core Standard 5** Students evaluate fuel and other fluids used in diesel engines to perform appropriate maintenance and optimization procedures	**DSTI-5.1** Identify the type of fuel and lubricating oil required for a diesel engine **DSTI-5.2** Service the coolant and fuel heaters	• Inspect fuel, oil, Diesel Exhaust Fluid (DEF) and coolant levels, and condition • Identify engine fuel, oil, coolant, air, and other leaks • Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor • Check engine oil level, condition, and consumption • Determine proper lubricant and perform oil and filter change • Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration • Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit • 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; replace as needed • Inspect water pump and hoses; replace as needed	• Engine oil change & oil system service • Coolant and filter changes • Customer diagnosis and repair work	9 weeks to introduce Reinforced throughout the year	• ASE certifications • Cummins certifications • Participation/Lab performance • Chapter tests • Lab based performance tests • Technical Skills Evaluation • Weekly participation • Classroom work • Dual credit