Correlation of

***Diesel Engine Technology,* Mack, Daniels, DeHart, Choe, Vieth**

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to

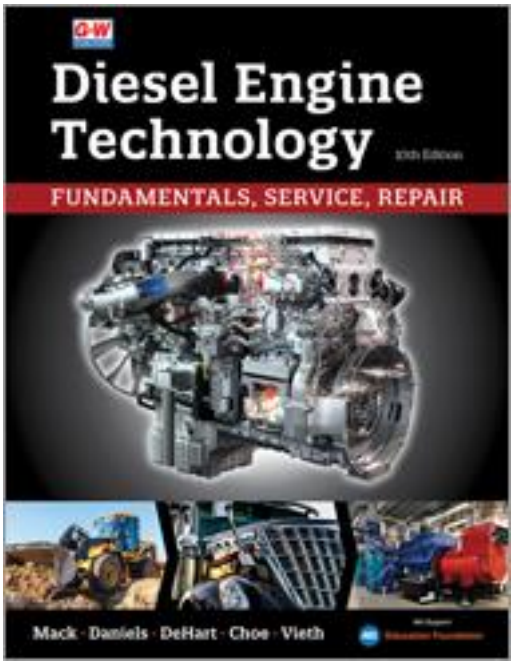
CASE AEMT

Goodheart-Willcox is pleased to partner with CASE 4 Learning (Curriculum for Agricultural Science Education) by correlating *Diesel Engine Technology* to the curricular concepts and performance objectives taught in their Agricultural Equipment Maintenance and Technology curriculum.

The correlation chart below lists the CASE Agricultural Equipment Maintenance and Technology curriculum concepts in the left column. Corresponding content from *Diesel Engine Technology* that a student can use to help understand the concept is in the right column.

CASE 4 Learning designs inquiry-based agricultural curriculum for middle and high school classrooms; offers lifetime certification, training and support for teachers; and prepares students for college and career readiness. CASE 4 Learning is an initiative of the National Council for Agricultural Education.

For more information about CASE 4 Learning, including a complete listing of their curricular offerings, please visit https://case4learning.org.



CASE Concepts	Textbook Pages
Unit 1 - Agricultural Equipment	
Lesson 1.1 Equipment Systems	
Agricultural equipment used by industry varies based on local crops and geographic location.	-
Technicians document plans and processes when servicing equipment.	-
Technicians use tools to make precise measurements.	-
A fastener's strength and size vary based on its purpose.	-
Power take-off (PTO) systems transfer power to agricultural implements.	-

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CASE Concepts	Textbook Pages
Powertrain systems contain belts, chains, and gears to deliver power for work.	-
Guarding and shielding agricultural equipment prevent injury to an operator.	-
Lesson 1.2 Technician Expectations	
Technicians follow a standard diagnostic procedure to inspect a problem, make repairs, and verify operation.	-
Agricultural equipment dealers prefer technicians with strong interpersonal skills.	-
Technicians use digital service procedure manuals to diagnose and repair equipment.	-
Technicians use a digital multimeter to diagnose and repair electrical systems.	-
Technicians utilize written reports, such as work/repair orders, to communicate services provided to a customer.	-
Component failure analysis allows technicians to analyze root cause failures.	-
Technicians use service manuals to perform diagnostics and repairs on agricultural equipment, leading to a longer life in powertrain systems and reducing operation costs.	-
Unit 2 – Drive Systems	
Lesson 2.1 Drive Train Components	
Gears change a drive train’s speed and torque.	-
Clutches engage and disengage torque from the power input to the power output.	-
Bearings reduce friction to increase efficiency in power train systems.	-
Technicians set and adjust gears to work effectively.	-
A drive train uses a combination of components to change the direction and speed of moving parts in a system.	-
Lesson 2.2 Final Drives	
Differentials allow implements to maintain equal torque at different speeds.	-
Planetary gears affect the torque, speed, and direction of a machine.	-
Technicians use precision measurement tools to set preload and endplay in a powertrain system.	-
Tire and tracks provide traction in agricultural equipment when proper ground contact is applied.	-

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CASE Concepts	Textbook Pages
Technicians use precision tools to complete a failure analysis and determine the root cause of an equipment failure.	-
Unit 3 – Precision Agriculture	
Lesson 3.1 Precision Systems	
Equipment calibration increases the efficiency of outputs and limits overlaps and skips in a field.	-
Precision systems require a wireless connection with satellites to find a geographic location.	-
Controller systems in precision agriculture include guidance systems, yield monitors, sensors, and automated outputs.	-
Precision agriculture increases production efficiencies that reduce application costs while improving yields.	-
Agricultural producers use sensors and automated controls to increase production efficiencies.	-
Lesson 3.2 Precision Applications	
Geographic information systems display vectors, features, and attributes.	-
A producer can predict a field's productivity by collecting data from specific locations.	-
Variable-rate application systems reduce producer costs while protecting the environment.	-
Lesson 3.3 The Data Advantage	
Agricultural producers use remote sensing devices to collect data for making production decisions.	-
Technicians use data to predict future repairs and maintenance.	-
Unit 4 – Electrical and Digital	
Lesson 4.1 Electrical Systems	
Agricultural equipment uses series, parallel, and series-parallel circuits.	-
Diodes protect electrical equipment by allowing power to flow in one direction.	-
Electrical systems use alternating and direct current.	-
Rheostats and potentiometers vary the resistance in an electrical circuit.	-
Lesson 4.2 Electrical Controls	
Technicians read schematics when designing, constructing, and troubleshooting electrical circuits.	-

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CASE Concepts	Textbook Pages
Electrical systems control how engine systems operate and function.	-
Agricultural equipment uses relays to control high amperage circuits that power specific components.	-
Electrical systems use resistors, diodes, potentiometers, and relays to control equipment components.	-
Technicians manage and troubleshoot controller systems used in precision agriculture.	-
Lesson 4.3 Electrical Analysis	
Technicians use diagnostic tools and Ohm's law as part of a systematic troubleshooting process.	-
Technicians maintain and troubleshoot systems directing electrical current between components.	-
Technicians use tools to troubleshoot and maintain GPS/GIS equipment.	-
Unit 5: Diesel Systems	
Lesson 5.1 Diesel Components	
There are functional differences between diesel and gasoline engines.	3, 4
Mechanical diesel injection systems have several components with specific functions.	55–56, 120–121, 143–144, 146, 259, 387, 504, 510–512, 521–522, 539–540, 546, 558, 570, 581–585, 587, 589, 591, 602, 605–607, 627
Diesel engines have systems that clean and pressurize the air and clean the exhaust.	153–154, 369–373, 392–394, 603, 699
Diesel engine systems have a variety of lubrication and liquid cooling systems.	134–143, 149, 323–326, 329, 335–346
Technicians use customer complaints combined with an inspection to determine the cause of engine failure.	10, 14, 19-21, 25, 59, 89, 127, 159, 232, 263, 297, 347, 380, 367, 443, 460, 474, 501, 518, 537, 557, 590, 608-609, 617, 623-633, 641, 659, 713
Lesson 5.2 Diesel and Electrical	
Diesel engines control connected systems using Controller Area Network (CAN) bus systems with Electronic Control Units (ECU) to monitor and control the engine.	393, 419-424, 593
A CAN bus allows a system of microcontrollers to control agricultural equipment.	516, 638,
High-pressure common rail diesel fuel systems have essential components with specific functions.	1, 7, 11, 118, 121, 145, 292, 349, 498, 511, 521, 529, 536, 546, 592-593, 604-607, 612, 620-621, 627, 633, 704, 727,
Unit 6 - Hydraulics	
Lesson 6.1 Hydraulic Principles	

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CASE Concepts	Textbook Pages
A hydraulic system has a pump, control valves, actuators, fluid, and hoses.	-
Technicians use schematics to identify fluid power components and systems.	-
The hydraulic systems can be closed or open-loop systems using positive or non-positive pumps.	-
A technician can control the fluid flow and pressure in a hydraulic system.	-
Pascal's Law determines the system pressure and components needed for a machine to operate.	-
Lesson 6.2 Hydraulic Systems and Safety	
Hydraulic fluids have specifications and properties that meet industry standards.	-
Technicians need to be aware of the potential safety hazards when working with hydraulic equipment.	-
Hydrostatic transmissions use variable to transfer energy in a power train.	-
Electro-hydraulic systems control cylinders in agricultural implements.	-
Hydraulics provide power in agricultural equipment for steering, braking, drivetrains, and axillary equipment.	-
Lesson 6.3 Hydraulic Maintenance	
Hydraulic components need to seal correctly and be free of air and contaminants to prevent wear and damage.	-
Technicians select fittings based on design and purpose.	-
Routine repair of a hydraulic system includes flushing a system and inspecting for particulate matter.	-
Unit 7 – Partnering in the Field	
Lesson 7.1 Practical Evaluation	
Technicians work with producers to periodically maintain equipment for optimum agricultural production.	-
Troubleshooting and service procedures are essential for long-term equipment performance.	-
Practical experiences are essential when preparing for a technical career.	-

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