Engines & Fuel Systems
Subject Code: 010220
Course & Unit Descriptions

Course Description:
In the *Engines & Fuel Systems* course, students will learn basic engine information and operations; different kinds of corollary systems; how to use test equipment and service tools; plus techniques for diagnosis and testing. Students will learn the different kinds of fuel systems, fuels and their characteristics, designations, and additives. Students will diagnose fuel system problems including the identification of parts failure and will be able to make necessary repairs.

Unit: Engines: How They Work

Students learn the principles of two and four stroke cycle operation, correct use of tools and instruments for working on small and large engines, following safety guidelines, understanding differences between two and four stroke engines, and performing tune-up operations.

Benchmark: 4.1 Safety Procedures
Level 2: Follow safety procedures in specific situations with specialized tools and equipment, evaluate situation and take corrective action

Indicators
4.1.01 Demonstrate knowledge of safety rules and regulations
4.1.02 Interpret safety signs and symbols
4.1.03 Model safe attitudes and behaviors (e.g., lifting, climbing)
4.1.04 Identify safety hazards and take corrective measures
4.1.05 Use safety equipment in accordance with established procedures
4.1.06 Follow established procedures for the administration of first aid and contact emergency medical personnel when necessary

Academic Standards
English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.04 Describe features, benefits and applications of engine types
4.4.05 Describe physical and mechanical principles of engine operation (i.e., motion, friction, thermodynamics)

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Basic Engine Components

Students learn to identify the basic internal parts of a 2 stoke and 4 stroke engine. Students will troubleshoot and repair engines used in stationary and mobile equipment.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures
4.2.12 Inspect and maintain tooling

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.12 Evaluate engine components to determine serviceability according to manufacturer's specifications
4.4.13 Repair/replace basic internal engine components
4.4.14 Repair/replace external engine components

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Gasoline Fuel Systems

Students will identify the types of gasoline fuels and the components that make them. Students learn to identify basic carburetion and electronic fuel systems used in engines along with the methods of repairing them.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.09 Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles)
4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)

Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.06 Classify and select engine lubricants, cooling agents and fuels
4.4.07 Identify and service/repair fuel/air system components
4.4.11 Identify and service/repair electronic control system

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: LP Fuel Systems

Students learn the components of engines operated by propane. Students will learn the specifications of these fuel systems and how to service and repair engines.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.03 Ensure presence and function of safety systems and hardware
4.2.09 Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles)
4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.06 Classify and select engine lubricants, cooling agents and fuels
4.4.07 Identify and service/repair fuel/air system components

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Diesel Fuel Systems

Students learn the operation and repair of modern diesel engines. Principles and theories are taught by running, testing, diagnosing, disassembling and reassembling components, systems, and engines.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.06 Service filtration systems
4.2.07 Identify, select and maintain fluid levels
4.2.09 Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles)
4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Evaluate the performance and select different types of internal combustion engines for various applications

Indicators
4.4.06 Classify and select engine lubricants, cooling agents and fuels
4.4.07 Identify and service/repair fuel/air system components
4.4.11 Identify and service/repair electronic control system

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Intake and Exhaust Systems

Students will learn the air intake and exhaust systems of engines. The purpose, design, types of air cleaners, and blowers of the intake system will be taught. Students will identify the purpose, design, and turbochargers of the exhaust system and maintenance of these systems.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.06 Service filtration systems
4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures

Academic Standards

English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)

Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.3 Equipment Operation

Level 2: Inspect and safely operate specialized equipment with some limitations to adjustments and functions

Indicators

4.3.03 Perform pre-operation inspection and adjustments

Academic Standards

English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)

Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines

Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators

4.4.07 Identify and service/repair fuel/air system components

Academic Standards

English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)

Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)

Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Lubrication Systems

Students learn to identify the different types of engine lubricants and lubrication systems. The purpose of oil, oil recommendations, types of oil filters, oil coolers, lubrication pumps, and oil leakage tests will be taught.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance

Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators

4.2.04 Service basic electrical systems (e.g., fuses and bulbs)
4.2.06 Service filtration systems
4.2.07 Identify, select and maintain fluid levels
4.2.09 Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles)
4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures

Academic Standards

English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)

Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.3 Equipment Operation
Level 2: Inspect and safely operate specialized equipment with some limitations to adjustments and functions

Indicators
4.3.03 Perform pre-operation inspection and adjustments
4.3.04 Perform appropriate start-up, operating and shut-down procedures

Academic Standards
English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.06 Classify and select engine lubricants, cooling agents and fuels
4.4.10 Identify and service/repair lubrication system components

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Cooling Systems

Students learn to identify the principles of engine coolants and the cooling systems found in most engines. Learners will troubleshoot and repair issues that relate to coolants, coolant recommendations, circuits and components.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.06 Service filtration systems
4.2.07 Identify, select and maintain fluid levels
4.2.09 Inspect and maintain fluid conveyance and storage components (e.g., hoses and lines, valves, nozzles)
4.2.10 Conduct preventative maintenance and identify causes of malfunctions and failures

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.3 Equipment Operation
Level 2: Inspect and safely operate specialized equipment with some limitations to adjustments and functions

Indicators
4.3.01 Follow manufacturer's recommended operating procedures and adjustment specifications
4.3.03 Perform pre-operation inspection and adjustments
4.3.04 Perform appropriate start-up, operating and shut-down procedures

Academic Standards
English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.06 Classify and select engine lubricants, cooling agents and fuels
4.4.09 Identify and service/repair cooling system components
4.4.13 Repair/replace basic internal engine components
4.4.14 Repair/replace external engine components

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Governing Systems

Students learn to identify basic engine governing methods and the devices necessary for control of rpm. Students will troubleshoot and repair systems using current methods and devices utilized in solving common engine starting problems.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.03 Ensure presence and function of safety systems and hardware

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.11 Identify and service/repair electronic control system
4.4.13 Repair/replace basic internal engine components
4.4.14 Repair/replace external engine components

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Engine Test Equipment, Service Tools, Diagnosis and Testing

Students will test and repair diesel engines using industry related mechanical tools, systems and methods.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.01 Perform a machine condition inspection
4.2.04 Service basic electrical systems (e.g., fuses and bulbs)
4.2.05 Perform machine adjustments (e.g., belts, clippers, drive chains)
4.2.11 Calibrate metering, monitoring, and sensing equipment
4.2.12 Inspect and maintain tooling

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.3 Equipment Operation
Level 2: Inspect and safely operate specialized equipment with some limitations to adjustments and functions

Indicators
4.3.01 Follow manufacturer’s recommended operating procedures and adjustment specifications
4.3.02 Describe function, limitations, and proper use of equipment, equipment controls and instrumentation
4.3.05 Identify, select and exhibit the desired application of hand and power tools
4.3.06 Perform post-operating inspection and adjustments

Academic Standards
English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.02 Analyze and troubleshoot engine
4.4.03 Evaluate engine performance
4.4.13 Repair/replace basic internal engine components
4.4.14 Repair/replace external engine components
4.4.15 Identify requirements for engine servicing to maintain emission requirements

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)

Unit: Engine Tune-Up

Students demonstrate tune up procedures for two and four stroke gas engines and diesel engines. Students will identify and maintain engine analysis, valve train, ignition fuel, starter, and safety compliance systems.

Benchmark: 4.2 Stationary and Mobile Equipment Maintenance
Level 2: Inspect and maintain specialized machinery and equipment according to schedule

Indicators
4.2.01 Perform a machine condition inspection
4.2.04 Service basic electrical systems (e.g., fuses and bulbs)
4.2.06 Service filtration systems
4.2.07 Identify, select and maintain fluid levels
4.2.08 Maintain machinery, equipment, instruments and facility cleanliness, appearance, and safety
Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.3 Equipment Operation
Level 2: Inspect and safely operate specialized equipment with some limitations to adjustments and functions

Indicators
4.3.01 Follow manufacturer's recommended operating procedures and adjustment specifications
4.3.02 Describe function, limitations, and proper use of equipment, equipment controls and instrumentation
4.3.03 Perform pre-operation inspection and adjustments
4.3.04 Perform appropriate start-up, operating and shut-down procedures
4.3.05 Identify, select and exhibit the desired application of hand and power tools
4.3.06 Perform post-operating inspection and adjustments

Academic Standards
English: Demonstrate comprehension of print and electronic text by responding to questions (e.g., literal, inferential, evaluative and synthesizing). (Reading Process B, 8-10; Reading Process B, 11-12)
Math: Apply mathematical knowledge and skills routinely in other content areas and practical situations. (Mathematical Processes B, 8-10)

Benchmark: 4.4 Engines
Level 2: Diagnose and repair components of both small and large internal combustion engines

Indicators
4.4.11 Identify and service/repair electronic control system
4.4.12 Evaluate engine components to determine serviceability according to manufacturer's specifications
4.4.13 Repair/replace basic internal engine components
4.4.14 Repair/replace external engine components
4.4.15 Identify requirements for engine servicing to maintain emission requirements

Academic Standards
English: Use appropriate self-monitoring strategies for comprehension. (Reading Process C, 8-10; Reading Process C, 11-12)
Math: Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision. (Measurement E, 8-10)
Science: Explain the movement of objects by applying Newton's three laws of motion. (Physical Sciences D, 9-10)