

Colorado AFNR Course Scope and Sequence

Course Name	Ag. Engine & Equipment Technology B		Course Details	Level 3 course in the Power, Structure, & Technology pathway. This course aligns with the Equipment Technician Strand.		
			Course = 0.50 Carnegie Unit Credit			
<b>Course Description</b>	This course builds on the systems and information gained in Agriculture Engines & Equipment Technology A. This course will use the fundamentals of small engines and move to the use of technical drawing and manuals for diagnosis, service of the systems, and components of all types of power engines such as outdoor power equipment, motorcycles, generators, and irrigation engines. Other course topics include multi-cylinder engines, hydraulics, and electric motors. This course is designed to provide hands-on and practical application for employment in the engine technology industry. Instruction includes the repair and service of cooling, air, fuel, lubricating, electrical, ignition, and mechanical systems and small engine overhauls.					
<b>Note:</b>	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.					
SCED Identification #	18402	Schedule calculation based on 60% of a semester instructional time. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.				
All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at <a href="https://www.cde.state.co.us/standardsandinstruction/essentialskills">https://www.cde.state.co.us/standardsandinstruction/essentialskills</a>						
Unit Number, Title and Brief Description	Suggested % of Instructional Time	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration	
<b>Unit 1: Workplace Equipment Safety</b>	2%	<b>PST.01.</b> Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.	<b>PST.01.02.</b> Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations. <i>SCIENCE: SC.HS.1.6 SC.HS.1.7 SC.HS.1.9</i>	<b>PST.01.02.03.a.</b> Examine owner's manuals to classify the types of safety hazards associated with different mechanical systems used in AFNR (e.g., caution, warning, danger, etc.).  <b>PST.01.02.03.b.</b> Select, maintain and demonstrate the proper use of tools, machines and equipment used in different AFNR related mechanical systems.		

				<b>PST.01.02.02.c.</b> Devise and document processes to safely implement and evaluate the safe use of AFNR related tools, machinery and equipment.	
<b>Unit 2: Equipment Classifications, stationary, self-propelled, non-powered</b>	1%	<b>PST.02.</b> Operate and maintain AFNR mechanical equipment and power systems.	<b>PST.02.02.</b> Operate machinery and equipment while observing all safety precautions in AFNR settings.  <b>PST.03.01.</b> Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	<b>PST.02.02.01.a.</b> Research and summarize the use of equipment, machinery and power units for AFNR power, structural and technical systems.  <b>PST.03.01.01.a</b> Identify and classify components of internal combustion engines used in AFNR power, structural and technical systems.	
<b>Unit 3: Equipment Manual &amp; Use/Service Intervals &amp; lubrication</b>	3%	<b>PST.02.:</b> Operate and maintain AFNR mechanical equipment and power systems.  <b>PST.03.</b> Service and repair AFNR mechanical equipment and power systems.	<b>PST.02.01</b> Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings.  <b>PST.03.01</b> Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	<b>PST.02.01.02.a.</b> Examine operator's manuals to determine recommendations for servicing filtration systems and maintaining fluid levels on equipment, machinery and power units used in AFNR power, structural and technical systems.  <b>PST.03.01.02.b.</b> Utilize technical manuals and diagnostic tools to determine service and repair needs of spark-and-compression internal combustion engines used in AFNR power, structural and technical systems.	
<b>Unit 4: Power Transmission</b> • Gear Pulleys	6%	<b>PST.02.</b> Operate and maintain AFNR mechanical	<b>PST.02.01.</b> Perform preventative maintenance and scheduled service to	<b>PST.02.01.02.c.</b> Assess and adjust equipment (e.g., belts and drives,	

<ul style="list-style-type: none"> <li>• Belts/Chains</li> <li>• PTO drives</li> <li>• Pitch</li> <li>• Speed Ratio</li> <li>• Belt Profile &amp; Types</li> <li>• Gear Types &amp; Applications</li> <li>• Adjustments</li> <li>• Universal joints</li> <li>• Phasing</li> </ul>		<p>equipment and power systems</p> <p><b>PST.03.</b> Service and repair AFNR mechanical equipment and power systems</p>	<p>maintain equipment, machinery and power units used in AFNR settings.</p> <p><b>PST.03.03.</b> Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).</p>	<p>chains, sprockets, etc.) and maintain fluid conveyance components (e.g., hoses, lines, nozzles, etc.) to ensure proper functioning.</p> <p><b>PST.03.03.02.a.</b> Compare and contrast operation principles and features of mechanical transmission systems used in AFNR power, structural and technical systems (e.g., belts, chains, gears, bearings, seals, universals, drive shafts, etc.).</p> <p><b>PST.03.03.02.b.</b> Utilize speed, torque and power measurements to calculate efficiency in power transmission systems used in AFNR power, structural and technical systems.</p> <p><b>PST.03.03.02.c.</b> Inspect, analyze and repair the components of power transmission systems used in AFNR power, structural and technical systems.</p>	
<p><b>Unit 5: Bearing Types, lubrication &amp; repair</b></p>	<p>3%</p>	<p><b>PST.03.</b> Service and repair AFNR mechanical equipment and power systems</p>	<p><b>PST.03.03.</b> Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic,</p>	<p><b>PST.03.03.02.a.</b> Compare and contrast operation principles and features of mechanical transmission systems used in AFNR power, structural and technical systems (e.g., belts, chains, gears,</p>	

			transmission, steering, suspension, etc.).	bearings, seals, universals, drive shafts, etc.).  <b>PST.03.03.02.b.</b> Utilize speed, torque and power measurements to calculate efficiency in power transmission systems used in AFNR power, structural and technical systems.  <b>PST.03.03.02.c.</b> Inspect, analyze and repair the components of power transmission systems used in AFNR power, structural and technical systems.	
<b>Unit 6: Equipment specific tools</b> <ul style="list-style-type: none"> <li>• Tool ID</li> <li>• Use</li> <li>• Dial Indicators</li> <li>• Feeler indicators</li> <li>• Caliper</li> <li>• Torque Wrench</li> <li>• Feeler Gage</li> </ul>	2%	<b>PST.01.</b> Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.	<b>PST.01.02.</b> Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations. <a href="#"><i>SCIENCE: SC.HS.1.6</i></a> <a href="#"><i>SC.HS.1.7</i></a> <a href="#"><i>SC.HS.1.9</i></a>	<b>PST.01.02.03.b.</b> Select, maintain and demonstrate the proper use of tools, machines and equipment used in different AFNR related mechanical systems.	
<b>Unit 7: Types, Purpose &amp; Operations of Clutches, Transmissions &amp; Final Drives</b>	4%	<b>PST.03.</b> Service and repair AFNR mechanical equipment and power systems	<b>PST.03.03.</b> Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).	<b>PST.03.03.02.a.</b> Compare and contrast operation principles and features of mechanical transmission systems used in AFNR power, structural and technical systems (e.g., belts, chains, gears, bearings, seals, universals, drive shafts, etc.).	

				<b>PST.03.03.02.c.</b> Inspect, analyze and repair the components of power transmission systems used in AFNR power, structural and technical systems.	
<b>Unit 8: Brakes –</b> <ul style="list-style-type: none"> <li>Types &amp; Adjustments</li> <li>Steering &amp; Suspension</li> <li>Axes &amp; Spring Design</li> <li>Tires</li> <li>Maintenance</li> <li>Ballast</li> <li>Weight</li> </ul>	6%	<b>PST.03.</b> Service and repair AFNR mechanical equipment and power systems	<b>PST.03.03.</b> Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).	<b>PST.03.03.03.a.</b> Identify and examine the components of suspension and steering systems used in AFNR power, structural and technical systems.  <b>PST.03.03.03.b.</b> Assess and analyze vehicle and machinery performance related to suspension and steering systems used in AFNR power, structural and technical systems.  <b>PST.03.03.03.c.</b> Inspect, analyze and repair vehicle suspension and steering systems used in AFNR power, structural and technical systems.	
<b>Unit 9: Equipment Setup, Adjustment &amp; Calibration</b> <ul style="list-style-type: none"> <li>Setup to Manual Specifications, operation adjustment, critical calibration</li> </ul>	6%	<b>PST.02.</b> Operate and maintain AFNR mechanical equipment and power systems.	<b>PST.02.02.</b> Operate machinery and equipment while observing all safety precautions in AFNR settings.	<b>PST.02.02.02.c.</b> Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.	
<b>Unit 10: Setup and measurement for precision technology</b> <ul style="list-style-type: none"> <li>Determining offsets, measuring equipment,</li> </ul>	3%	<b>PST.05.</b> Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.	<b>PST.05.03.</b> Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.	<b>PST.05.03.02.a.</b> Examine the components of precision technologies used in AFNR systems.	

manual interpretation				<b>PST.05.03.02.c.</b> Install, maintain and service instrumentation and equipment used for precision technologies (i.e., GPS receivers, yield monitors, remote sensors, etc.) used in AFNR systems.	
<b>Unit 11: Understanding of Hydraulic systems &amp; maintenance</b>	5%	<b>PST.03</b> Service and repair AFNR mechanical equipment and power systems.	<b>PST.03.03.</b> Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).	<b>PST.03.03.01.a.</b> Research and summarize the applications of common types of hydraulic and pneumatic systems used in AFNR power, structural and technical systems.	
<b>Unit 12: Understanding DC electrical Systems</b>	5%	<b>PST.03.</b> Service and repair AFNR mechanical equipment and power systems	<b>PST.03.02.</b> Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.	<b>PST.03.02.01.a</b> Compare and contrast basic units of electricity (e.g., volts, amps, watts, and ohms) and the principles that describe their relationship (e.g., Ohm's Law, Power Law, etc.).	
<b>Unit 13: Electrical Motor Power Systems</b>	3%	<b>PST.03.</b> Service and repair AFNR mechanical equipment and power systems	<b>PST.03.02.</b> Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.	<b>PST.03.02.02.a.</b> Compare and contrast the characteristics of electronic components used in AFNR power, structural and technical systems (e.g., battery, resistor, diode, transistor, capacitor, etc.).	
<b>Unit 14: Towable Implements, GVW, DMV requirements</b>	4%	<b>PST.02.:</b> Operate and maintain AFNR mechanical equipment and power systems.	<b>PST.02.02.</b> Operate machinery and equipment while observing all safety precautions in AFNR settings.	<b>PST.02.02.02.a.</b> Examine and identify safety hazards associated with equipment, machinery and power units used in AFNR power, structural, and technical systems (e.g.,	

				<p>caution, warning, danger, etc.).</p> <p><b>PST.02.02.02.b.</b> Apply safety principles and applicable regulations to operate equipment, machinery and power units used in AFNR power, structural and technical systems.</p> <p><b>PST.02.02.02.c.</b> Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.</p>	
--	--	--	--	--	--

**CAS Academic Standards Alignment:** Online Version: <https://www.cde.state.co.us/apps/standards/>; Download version: <https://www.cde.state.co.us/apps/standards/>

- SC.HS.1.6 – Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system.
- SC.HS.1.7 – Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.
- SC.HS.1.9 – Although energy cannot be destroyed, it can be converted to less useful forms as it is captured, stored, and transferred.

**Essential Skills:**

Problem Solver:

- **Critical Thinking and Analysis:** The ability to apply a deliberate process of identifying problems, gathering information, and weighing possible solutions, including: making choices rooted in understanding patterns, cause-and-effect relationships, and the impacts that a decision can have on the individual and others.
- **Creativity and innovation:** the ability to demonstrate curiosity and imagination through experimenting with new and emerging ideas.

Empowered Individual:

- **Self-Awareness:** the ability to understand one’s own emotions, thoughts, and values, and how personal actions and emotions influence behavior across contexts, including: the capacity to recognize one’s strength and limitations with a well-grounded sense of confidence and purpose.

