

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			
Course Description	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.					
Note:	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 https://www.cde.state.co.us/standardsandinstruction/essentialskills						
Unit Number, Title and Brief Description	Suggested % of Instructional Time	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration	
Unit 1: Workplace Equipment Safety	2%	PST.01. Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.	PST.01.02. Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations. SCIENCE: SC.HS.1.6 SC.HS.1.7 SC.HS.1.9	PST.01.02.03.a. 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.). PST.01.02.03.b. Select, maintain and demonstrate the proper use of tools, machines and equipment used in different AFNR related mechanical systems.		

				PST.01.02.02.c. Devise and document processes to safely implement and evaluate the safe use of AFNR related tools, machinery and equipment.	
Unit 2: Equipment Classifications, stationary, self-propelled, non-powered	1%	PST.02. Operate and maintain AFNR mechanical equipment and power systems.	PST.02.02. Operate machinery and equipment while observing all safety precautions in AFNR settings. PST.03.01. Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	PST.02.02.01.a. Research and summarize the use of equipment, machinery and power units for AFNR power, structural and technical systems. PST.03.01.01.a Identify and classify components of internal combustion engines used in AFNR power, structural and technical systems.	
Unit 3: Equipment Manual & Use/Service Intervals & lubrication	3%	PST.02.: Operate and maintain AFNR mechanical equipment and power systems. PST.03. Service and repair AFNR mechanical equipment and power systems.	PST.02.01 Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings. PST.03.01 Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	PST.02.01.02.a. 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. PST.03.01.02.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.	

Unit 4: Power Transmission • Gear Pulleys • Belts/Chains • PTO drives • Pitch • Speed Ratio • Belt Profile & Types • Gear Types & Applications • Adjustments • Universal joints • Phasing	6%	PST.02. Operate and maintain AFNR mechanical equipment and power systems PST.03. Service and repair AFNR mechanical equipment and power systems	PST.02.01. Perform preventative maintenance and scheduled service to maintain equipment, machinery and power units used in AFNR settings. PST.03.03. Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).	PST.02.01.02.c. Assess and adjust equipment (e.g., belts and drives, chains, sprockets, etc.) and maintain fluid conveyance components (e.g., hoses, lines, nozzles, etc.) to ensure proper functioning. PST.03.03.02.a. 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.). PST.03.03.02.b. Utilize speed, torque and power measurements to calculate efficiency in power transmission systems used in AFNR power, structural and technical systems. PST.03.03.02.c. Inspect, analyze and repair the components of power transmission systems used in AFNR power, structural and technical systems.	
Unit 5: Bearing Types, lubrication & repair	3%	PST.03. Service and repair AFNR mechanical equipment and power systems	PST.03.03. Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in	PST.03.03.02.a. Compare and contrast operation principles and features of mechanical transmission	

			machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).	systems used in AFNR power, structural and technical systems (e.g., belts, chains, gears, bearings, seals, universals, drive shafts, etc.). PST.03.03.02.b. Utilize speed, torque and power measurements to calculate efficiency in power transmission systems used in AFNR power, structural and technical systems. PST.03.03.02.c. Inspect, analyze and repair the components of power transmission systems used in AFNR power, structural and technical systems.	
Unit 6: Equipment specific tools • Tool ID • Use • Dial Indicators • Feeler indicators • Caliper • Torque Wrench • Feeler Gage	2%	PST.01. Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural and technical systems.	PST.01.02. Apply physical science and engineering principles to design, implement and improve safe and efficient mechanical systems in AFNR situations. SCIENCE: SC.HS.1.6 SC.HS.1.7 SC.HS.1.9	PST.01.02.03.b. Select, maintain and demonstrate the proper use of tools, machines and equipment used in different AFNR related mechanical systems.	
Unit 7: Types, Purpose & Operations of Clutches, Transmissions & Final Drives	4%	PST.03. Service and repair AFNR mechanical equipment and power systems	PST.03.03. Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic,	PST.03.03.02.a. Compare and contrast operation principles and features of mechanical transmission systems used in AFNR power, structural and technical systems (e.g.,	

			transmission, steering, suspension, etc.).	belts, chains, gears, bearings, seals, universals, drive shafts, etc.). PST.03.03.02.c. Inspect, analyze and repair the components of power transmission systems used in AFNR power, structural and technical systems.	
Unit 8: Brakes – - Types & Adjustments - Steering & Suspension - Axes & Spring Design - Tires - Maintenance - Ballast - Weight	6%	PST.03. Service and repair AFNR mechanical equipment and power systems	PST.03.03. Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).	PST.03.03.03.a. Identify and examine the components of suspension and steering systems used in AFNR power, structural and technical systems. PST.03.03.03.b. Assess and analyze vehicle and machinery performance related to suspension and steering systems used in AFNR power, structural and technical systems. PST.03.03.03.c. Inspect, analyze and repair vehicle suspension and steering systems used in AFNR power, structural and technical systems.	
Unit 9: Equipment Setup, Adjustment & Calibration Setup to Manual Specifications, operation	6%	PST.02. Operate and maintain AFNR mechanical equipment and power systems.	PST.02.02. Operate machinery and equipment while observing all safety precautions in AFNR settings.	PST.02.02.02.c. Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.	

adjustment, critical calibration					
Unit 10: Setup and measurement for precision technology Determining offsets, measuring equipment, manual interpretation	3%	PST.05. Use control, monitoring, geospatial and other technologies in AFNR power, structural and technical systems.	PST.05.03. Apply geospatial technologies to solve problems and increase the efficiency of AFNR systems.	PST.05.03.02.a. Examine the components of precision technologies used in AFNR systems. PST.05.03.02.c. Install, maintain and service instrumentation and equipment used for precision technologies (i.e., GPS receivers, yield monitors, remote sensors, etc.) used in AFNR systems.	
Unit 11: Understanding of Hydraulic systems & maintenance	5%	PST.03 Service and repair AFNR mechanical equipment and power systems.	PST.03.03. Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment and power source systems (e.g., hydraulic, pneumatic, transmission, steering, suspension, etc.).	PST.03.03.01.a. Research and summarize the applications of common types of hydraulic and pneumatic systems used in AFNR power, structural and technical systems.	
Unit 12: Understanding DC electrical Systems	5%	PST.03. Service and repair AFNR mechanical equipment and power systems	PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.	PST.03.02.01.a 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.).	
Unit 13: Electrical Motor Power Systems	3%	PST.03. Service and repair AFNR mechanical equipment and power systems	PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.	PST.03.02.02.a. Compare and contrast the characteristics of electronic components used in AFNR power, structural and technical systems (e.g., battery,	

				resistor, diode, transistor, capacitor, etc.).	
Unit 14: Towable Implements, GVW, DMV requirements	4%	PST.02.: Operate and maintain AFNR mechanical equipment and power systems.	PST.02.02. Operate machinery and equipment while observing all safety precautions in AFNR settings.	PST.02.02.02.a. Examine and identify safety hazards associated with equipment, machinery and power units used in AFNR power, structural, and technical systems (e.g., caution, warning, danger, etc.). PST.02.02.02.b. Apply safety principles and applicable regulations to operate equipment, machinery and power units used in AFNR power, structural and technical systems. PST.02.02.02.c. Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.	

Academic Standards Alignment

Colorado CTE courses are required to integrate academic and essential skills into course content. The following academic standards have been identified as aligned to this course and should be integrated throughout instruction.

[CO CTE Academic Standards Resources](#) (Rubrics, integration strategies, etc)

[CDE Colorado Academic Standards Online](#) (Online standards lookup tool)

Standard 1: Oral Expression and Listening

Prepared Graduate 1: Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group's attainment of an objective.

Students collaborate during diagnostic and repair activities to troubleshoot engine and equipment malfunctions, perform maintenance procedures, and safely service agricultural equipment while communicating effectively with instructors and team members.

Prepared Graduate 2: Deliver effective oral presentations for varied audiences and varied purposes.

Students communicate diagnostic findings, repair procedures, equipment operation, and maintenance recommendations through demonstrations, technical discussions, and project presentations using appropriate agricultural equipment terminology.

Standard 2: Reading for All Purposes

Prepared Graduate 4: Read a wide range of informational texts to build knowledge and to better understand the human experience.

Students interpret service manuals, hydraulic and electrical schematics, equipment specifications, manufacturer documentation, and safety procedures to diagnose, repair, and maintain agricultural equipment.

Prepared Graduate 5: Understand how language functions in different contexts, command a variety of word-learning strategies to assist comprehension, and make effective choices for meaning or style when writing and speaking.

Students apply technical vocabulary while interpreting diagnostic information, following manufacturer procedures, documenting repairs, and communicating equipment service information.

Prepared Graduate 3 (literary texts) is not directly addressed by this course.

Standard 3: Writing and Composition

Prepared Graduate 7: Craft informational/explanatory texts using techniques specific to the genre.

Students prepare maintenance records, diagnostic reports, repair documentation, equipment inspection records, and technical summaries that explain troubleshooting procedures, repairs, and equipment performance.

Prepared Graduate 9: Demonstrate mastery of their own writing process with clear, coherent, and error-free polished products.

Students produce organized service records, preventive maintenance documentation, repair reports, and technical records that accurately communicate equipment conditions, repairs, and completed maintenance procedures.

Prepared Graduate 6 (argument writing) and Prepared Graduate 8 (narrative writing) are not explicitly supported by the course standards.

Standard 4: Research Inquiry and Design

Prepared Graduate 10: Gather information from a variety of sources; analyze and evaluate its quality and relevance; and use it ethically to answer complex questions.

Students research manufacturer specifications, hydraulic and electrical systems, diagnostic procedures, replacement parts, equipment technologies, and maintenance recommendations to troubleshoot equipment failures, select appropriate repair methods, and improve equipment performance.

Note: *Mathematics and Science standards will be added in the future. Visit the [Colorado Academic Standards](#) page for the most current version.*