CareerClusters® PATHWAYS TO COLLEGE & CAREER READINESS
Agriculture, Food & Natural Resources

Learning that works for Colorado CTE®

Colorado AFNR Course Scope and Sequence

Course Name	**Ag. Engine & Equipment Technology A**		**Course Details** **Course = 0.50 Carnegie Unit Credit**	Level 3 course in the Power, Structure, & Technology pathway. This course aligns with the Equipment Technician Strand.	
Course Description	This course will consist of the basic theory, operation and maintenance of the internal combustion engine primarily small engines. Students will gain basic understanding and interpretation of technical manuals. This course will also offer career opportunities in the equipment technician field. The course focuses on engines in compact equipment utilized in agriculture, construction and the green industry. Class time is divided between hands-on activities in the lab and classroom instruction.				
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: Careers in Ag Equipment Industry/Tech	2%	**CRP.10.** Plan education and career path aligned to personal goals.	**CRP.10.02.** Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.	**CRP.10.02.01.b.** Analyze the steps to meet career advancement requirements for potential careers	
Unit 2: Workplace Safety	2%	**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.).	
Unit 3: Theory of Engine Operation	2%	**PST.03**. Service and repair AFNR mechanical equipment and power systems.	**PST.03.01** Troubleshoot, service and repair components of internal	**PST.03.01.02.a.** Distinguish the characteristics of spark- and- compression internal	

• Combustion & Why engines work (thermodynamics)			combustion engines using manufacturers' guidelines.	combustion engines used in AFNR power, structural and technical systems.	
Unit 4: Review (content from level 2 PSTS Principles) • Engine types 2 stroke vs 4 stroke • Multiple cylinder engines • Gas vs. Diesel • Engine Systems- Purpose and operation	3%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.a** Identify and classify components of internal combustion engines used in AFNR power, structural and technical systems. **PST.03.01.02.a.** Distinguish the characteristics of spark-and- compression internal combustion engines used in AFNR power, structural and technical systems.	
Unit 5: Fuel Systems • Fuel Types • Carburetor Function • Fuel Delivery methods	3%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.b.** Analyze and explain how the components of internal combustion engines interrelate during operation.	
Unit 6: Electrical Systems • Ignition • Components & Design • Spark Plug function • Charging and starting 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 7: Governor Systems • Mechanical function • Electrical Function	2%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.b.** Analyze and explain how the components of internal combustion engines interrelate during operation.	
Unit 8: Lubrication Systems • Function & Operation	2%	**PST.02.** Operate and maintain AFNR mechanical equipment and power systems.	**PST.02.01** Perform preventative maintenance and scheduled service to maintain equipment,	**PST.02.01.02.a** Examine operator's manuals to determine recommendations for	

• Oils			machinery, and power units used in AFNR settings	servicing filtration systems and maintaining fluid levels on equipment, machinery, and power units used in AFNR power, structural, and technical systems.	
Unit 9: Cooling systems • Air cooled systems • Liquid cooled systems • Coolant	2%	**PST.02.** Operate and maintain 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.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.	
Unit 10: Engine Components, ID, Purpose, & Specialty Tools • Key engine components • Basic engine tools • Specialty Tools • Measurement tools	4%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.a** Identify and classify components of internal combustion engines used in AFNR power, structural and technical systems.	
Unit 11: Intake, exhaust, & emissions systems • Emission standards • Intake & exhaust operations	5%	**PST.03** Service and repair AFNR mechanical equipment and power systems.	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.b.** Analyze and explain how the components of internal combustion engines interrelate during operation.	
Unit 12: Engine Troubleshooting • Isolation of problem techniques • Application of engine operation	3%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.c.** Evaluate service and repair needs for internal combustion engines using a variety of performance tests (e.g., manuals, computer-based diagnostics, etc.).	

knowledge to solve issue					
Unit 13: Reading engine resource & manuals • Determination of engine model data • Navigation of technical manuals	2%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**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 14: Measurement & Part Analysis • Measurement tools • Measurement Tolerance • Recording measurement data	3%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.a** Identify and classify components of internal combustion engines used in AFNR power, structural and technical systems.	
Unit 15: Engine disassembly procedure & Evaluation • Disassembly procedure • Evaluation of wear & clearances • Parts storage	14% (flexible)	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.02.c.** Inspect, analyze and repair spark-and- compression internal combustion engines used in AFNR power, structural and technical systems.	
Unit 16: Engine Assembly • Assembly procedures • Torque Sequence • Settings & Adjustments	14% (flexible)	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.02.c.** Inspect, analyze and repair spark-and- compression internal combustion engines used in AFNR power, structural and technical systems.	
Unit 17: Diesel Fuel Systems & Operations • Difference from gas engines • Fuel Delivery • Ignition	5%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.b.** Analyze and explain how the components of internal combustion engines interrelate during operation.	

Unit 18: Engine Maintenance and service intervals • Identifying and following service recommendations	2%	**PST.03.** Service and repair AFNR mechanical equipment and power systems	**PST.03.01** Troubleshoot, service and repair components of internal combustion engines using manufacturers' guidelines.	**PST.03.01.01.c**. Evaluate service and repair needs for internal combustion engines using a variety of performance tests (e.g., manuals, computer-based diagnostics, etc.).	

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

No current academic alignment.

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.
- Career Awareness: The ability to apply the knowledge and understanding of how one's dreams, experiences, and interests translate into career fulfillment and lifelong pursuits in local, regional, national, and global career pathways and opportunities.