

AFNR Content Standards Alignment – Small Gas Engines

The **AFNR Content Standards Alignment** aligns CASE 4 Learning (CASE) Concepts and Performance Objectives to the National AFNR Content standards and performance indicators developed by the National Council for Agricultural Education (The Council). In the CASE learning model, Concepts are key elements of understanding that students are expected to learn. Concepts are developed by a curriculum committee of content experts comprised of industry representatives, post-secondary educators, and secondary teachers. Performance Objectives are how students will demonstrate their understanding of the concept. All Concepts and Performance Objectives measure student competency of the AFNR Content Standards within each Pathway.

The AFNR Content Standards provide state agricultural education leaders and educators with a high-quality, rigorous set of standards to guide what students should know and be able to do after completing a program of study in each of the following AFNR Career Pathways:

- Career Ready Practices
- Foundational
- Agribusiness Systems
- Animal Systems
- Biotechnology Systems
- Education, Communication, and Leadership
- Environmental Sustainability Systems
- Food Products and Processing Systems
- Natural Resource Systems
- Plant Systems
- Power, Structural, and Technical Systems

DEFINITIONS: Within each pathway, the standards are organized and aligned to CASE curriculum as follows:

- **Standards** – These are the standards owned by Advance CTE and used here with permission. The standards defined the scope and guided the development of the updated indicators and CASE measurements.
- **Performance Indicators** – These statements distill each standard into more discrete indicators of the knowledge and skills students should attain through a program of study in this pathway. Attainment of the knowledge and skills outlined in the performance indicators is intended to demonstrate an acceptable level of proficiency with the related standard at the conclusion of a program of study in this area.
- **CASE Measurements** – These are CASE Concepts with bulleted Performance Objectives. Students carry out the Performance Objectives to show understanding of the Concept, which indicates attainment of each performance indicator. The beginning CASE measurements require students to remember, understand, identify, explain, and summarize information. The intermediate CASE measurements require students to apply, analyze, compare, distinguish, and examine information and scenarios. The advanced CASE measurements require students to assess, evaluate, justify, improve, and create.

The **Small Gas Engines** curriculum measures student competencies in the AFNR Pathways included in this blueprint. For more information about the National AFNR Content Standards, visit The National Council for Agricultural Education’s website at <https://www.thencae.org/afnr-standards>.

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.03. Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.03.01. Identify and explain the implications of required regulations to maintain and improve safety, health, and environmental management systems.	SGE 1.1 Concept 2 Site-specific safety policies and procedures are in place for agricultural mechanic shops and labs.	SGE 1.2 Concept 3 Safety Data Sheets (SDS) contain important information on the proper use and cleaning of materials.	SGE 1.2 Concept 1 Working in a mechanical shop requires diligence when following safety procedures and expectations.
	<ul style="list-style-type: none"> Identify workplace hazards and the root cause of accidents. Develop a standard set of safety requirements for an agricultural shop. 	<ul style="list-style-type: none"> Use SDS forms to determine the proper use and cleanup of chemicals used in the course. 	<ul style="list-style-type: none"> Identify near misses and complete an example near-miss report.
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.03.02. Develop and implement a plan to maintain and improve health, safety, and environmental compliance and performance.	SGE 1.1 Concept 4 Personal protective equipment is the last line of defense against injury.	SGE 1.1 Concept 3 Safety must be planned and systematic for effective identification and management in a laboratory or shop.	SGE 1.1 Concept 5 The purpose of first aid is to treat injuries or accidents to sustain life until professional medical attention can be received.
	<ul style="list-style-type: none"> Identify types of PPE and their uses in the shop. 	<ul style="list-style-type: none"> Assess a shop to determine if safety standards are being met and make recommendations for improvements. 	<ul style="list-style-type: none"> Prepare an emergency first aid booklet.

FOUNDATIONAL PATHWAY SKILLS STANDARD

FPS.08. Utilize critical thinking to make sense of problems and persevere in solving them.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
FPS.08.02. Develop employability skills needed to be successful in a chosen career field.	SGE 1.2 Concept 2 Agricultural employees need to work efficiently and communicate effectively in the workplace.		
	<ul style="list-style-type: none"> Describe and identify employability skills that industry employers expect of employees. 		

CAREER READY PRACTICES STANDARD

CRP.04. Communicate clearly, effectively and with reason.

Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.04.02. Produce clear, reasoned, and coherent written and visual communication in formal and informal settings.			<p>SGE 1.1 Concept 1 Organization and record-keeping are important to success in agricultural mechanics.</p> <ul style="list-style-type: none"> • Develop and keep an <i>Agriscience Notebook</i> to record and store information. <p>SGE 3.1 Concept 3 Technicians utilize written reports, such as <i>Work/Repair Orders</i>, to communicate services provided to a customer.</p> <ul style="list-style-type: none"> • Write a <i>Work/Repair Order</i> using technical writing.

CAREER READY PRACTICES STANDARD

CRP.11. Use technology to enhance productivity.
 Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring and using new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks – personal and organizational – of technology applications, and they take actions to prevent or mitigate these risks.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
CRP.11.01. Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.			<p>SGE 1.2 Concept 6 Technicians use digital service procedure manuals to diagnose and repair equipment.</p> <ul style="list-style-type: none"> • Locate key information using a digital service manual.

POWER, STRUCTURAL, AND TECHNICAL SYSTEMS STANDARD

PST.02. Operate and maintain AFNR mechanical equipment and power systems.

PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.02.01. Perform preventative maintenance and scheduled service to maintain equipment, machinery,	SGE 2.3 Concept 1 A fastener's strength and size vary based on its purpose.	SGE 2.3 Concept 4 Lubrication and bearings reduce wear on an engine.	SGE 3.1 Concept 1 Technicians use service manuals to determine engine maintenance and repair costs.

and power units used in AFNR settings.	<ul style="list-style-type: none"> Identify bolt size, type, and grade. 	<ul style="list-style-type: none"> Identify wear points in an engine. Describe the systems in place to reduce wear. 	<ul style="list-style-type: none"> Use an electronic service manual to find and identify part numbers and costs. Create a service plan for a small engine.
	SGE 2.3 Concept 2 Technicians use tools to make precise measurements.		
	<ul style="list-style-type: none"> Use a micrometer to make precise measurements. 		
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.02.02. Operate machinery and equipment while observing all safety precautions in AFNR settings.	SGE 1.2 Concept 4 Guarding and shielding agricultural equipment prevent injury to an operator.	SGE 1.2 Concept 5 Engine operators use safe practices to protect themselves and those around them.	SGE 1.2 Concept 5 Engine operators use safe practices to protect themselves and those around them.
	<ul style="list-style-type: none"> Identify the safety hazards found in the internal motions of equipment. 	<ul style="list-style-type: none"> Complete a Tool Operation Template and Equipment Safety Checklist for a small engine. 	<ul style="list-style-type: none"> Safely operate an engine.

POWER, STRUCTURAL, AND TECHNICAL SYSTEMS STANDARD			
PST.03. Service and repair AFNR mechanical equipment and power systems.			
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.03.01. Troubleshoot, service, and repair components of internal combustion engines using manufacturers' guidelines.	SGE 2.1 Concept 1 Four-stroke cycle engines systematically process energy inputs and produce energy outputs.	SGE 2.1 Concept 3 Technicians use diagnostic tools to solve mechanical problems caused by improper design or product failure.	SGE 2.2 Concept 2 A small engine carburetor has a series of parts used to increase fuel efficiency.
	<ul style="list-style-type: none"> Develop a storyboard to identify inputs, processes, and outputs in a four-stroke cycle small engine. Use the flow chart with the leakdown tester to identify the current stroke of an engine. 	<ul style="list-style-type: none"> Test an engine's electrical and compression system to ensure proper working order. Identify diagnostic tests for finding an ignition or compression problem in an engine. 	<ul style="list-style-type: none"> Construct a prototype of a carburetor. Improve a prototype of a carburetor to produce the optimum air-fuel ratio.
	SGE 2.1 Concept 2 A small engine consists of a series of systems converting energy from one form to another in a controlled manner.	SGE 2.2 Concept 1 Machine disassembly requires a systematic process that is sequential and organized.	SGE 2.3 Concept 5 Proper assembly prevents malfunctions in a small engine.
	<ul style="list-style-type: none"> Define small engine systems and record the inputs and outputs of each system. Record the energies transferred throughout the systems in an engine. Measure the thermal energy transferred in an engine. 	<ul style="list-style-type: none"> Document and organize the disassembly of a small engine. 	<ul style="list-style-type: none"> Reassemble a small engine using correct torque and sequencing of bolts, spacing of valves, and spacing of armature.

	SGE 2.2 Concept 5 Engine components are designed for a specific application or function.	SGE 2.2 Concept 3 Governor controls and electrical systems in an engine are used to manage the fuel input and energy output.	SGE 2.2 Concept 4 Tolerances and specifications guide how small engine components are assembled together to function effectively.
	<ul style="list-style-type: none"> Identify types of metals found in an engine and the purpose of each. 	<ul style="list-style-type: none"> Diagram how the governor adjusts small engine speed. 	<ul style="list-style-type: none"> Measure and adjust valve clearances for a small engine.
		SGE 2.2 Concept 5 Engine components are designed for a specific application or function.	
		<ul style="list-style-type: none"> Diagram and calculate the gear ratios and speeds in a small engine. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.03.02. Service electrical systems and components of mechanical equipment and power systems using a variety of troubleshooting and/or diagnostic methods.		SGE 2.2 Concept 3 Governor controls and electrical systems in an engine are used to manage the fuel input and energy output.	
		<ul style="list-style-type: none"> Draw a schematic of the electrical system in a small engine. 	
PERFORMANCE INDICATOR	CASE MEASUREMENTS		
	Beginning	Intermediate	Advanced
PST.03.03. Utilize manufacturers' guidelines to diagnose and troubleshoot malfunctions in machinery, equipment, and power source systems (e.g., hydraulic, pneumatic, transmission, steering, powertrain, suspension, etc.).	SGE 2.3 Concept 3 Technicians use part specifications to ensure mechanical components fit together and work properly	SGE 2.3 Concept 3 Technicians use part specifications to ensure mechanical components fit together and work properly	SGE 2.3 Concept 6 Technicians monitor and adjust engines for power and speed.
	<ul style="list-style-type: none"> Locate part standard and reject sizes in a repair manual. 	<ul style="list-style-type: none"> Measure the wear on a crankshaft and find the specification for replacement. 	<ul style="list-style-type: none"> Set the governed speed of a small engine.
			SGE 3.1 Concept 2 Technicians follow a standard diagnostic procedure to inspect a problem, make repairs, and verify operation.
			<ul style="list-style-type: none"> Identify the parts of the six-step diagnostic process during a guest technician presentation.