Course Description
Students will develop knowledge and skills in the application of principles and techniques of power, structural, and technical systems used in the agricultural industry, particularly agricultural production and service. Instruction includes classroom and laboratory learning and the application of the concepts taught through supervised agricultural experience. Students will develop basic skills in areas of hot and cold metal work, tool reconditioning, plumbing, painting, bill of materials preparation, small gas engines, and welding. The basic practices associated with soil and water management are included. Safety and proper use of tools and equipment will be emphasized.
**Agricultural Systems and Technology 1**

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<th><strong>Intended Grade Level</strong></th>
<th>9-12</th>
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**STRAND 1**

Students will explain the role of FFA in agricultural education.

**Standard 1**

Discuss the history and organization of FFA as it relates to the complete program of agricultural education.

- Explain the interrelationship of classroom and laboratory instruction, supervised agricultural experience, and FFA.
- Describe how, when, and why FFA was organized.
- Identify key FFA historical events.
- Identify the mission and strategies, colors, motto, emblem and parts of the emblem, and organizational structure of FFA.
- Recite and explain the meaning of the FFA Creed.
- Discuss the meaning and purpose of a program of activities and its committee structure.
- List FFA chapter officers, and discuss the role of each.

**Standard 2**

Identify opportunities in FFA.

- Describe FFA opportunities that develop leadership skills personal growth, and career success.
- Summarize major state and national activities available to FFA members.

**Standard 3**

Describe FFA degrees, awards, and career development events (CDEs).

- List and explain the FFA degree areas.
- Identify FFA proficiency awards.
- List and discuss various team and individual CDEs.
Performance Objective

- Recite and explain the meaning of the FFA Creed.
- Attend an FFA meeting/participate in an FFA activity.

STRAND 2

Students will explain the role of supervised agricultural experience (SAE) programs in agricultural education.

Standard 1

Examine the responsibilities and benefits associated with an SAE.
- Explain the meaning and benefits of supervised agricultural experience.
- Explain the characteristics of an effective SAE program and the responsibilities of those involved.

Standard 2

Determine the types of SAE programs.
- Compare entrepreneurship SAEs and placement SAEs.
- Describe research/experimentation SAEs.
- Describe exploratory SAEs.

Standard 3

Plan an SAE program.
- Identify the steps in planning an SAE program.
- Describe the function of a business/training plan and/or agreement in an SAE program.
- Develop a short-range plan and a long-range plan for an SAE program.
- Relate classroom and laboratory instruction to an SAE program.

Standard 4

Maintain and use SAE records.
- Explain the importance of keeping records on an SAE program.
- Explain how SAE records are organized.
- Follow approved procedures to make entries in SAE records.

Performance Objective

- Prepare a plan for a long-term SAE.
- Record all transactions and activities on a SAE in an approved record book.
STRAND 3

Students will describe the role of agricultural education in agricultural systems and technology.

Standard 1
Investigate agricultural power, structural, and technical systems.
- Explain the meaning and importance of agricultural power, structural, and technical systems.
- Identify and describe career opportunities in agricultural power, structural, and technical systems.

STRAND 4

Students will demonstrate appropriate safety practices in agricultural power, structural, and technical systems in laboratory and work settings.

Standard 1
Explain the meaning and importance of safety in agricultural power, structural, and technical systems.
- Define safety, and describe why it is important.
- Identify safety hazards, and demonstrate the actions needed to minimize or eliminate risk associated with agricultural power, structural, and technical systems in learning and/or work facilities.

Standard 2
Implement safety practices related to agricultural power, structural, and technical systems in learning and work facilities.
- Identify, select, and properly use appropriate personal protective equipment (PPE).
- Explain the standard OSHA color codes for marking physical hazards.
- Verify that all equipment is in good operating condition according to OSHA standards and that appropriate safety devices are in place and working (e.g., guards in place, tool rests adjusted, etc.).
- Maintain a neat, well-organized laboratory or shop working area.

Standard 3
Identify fire hazard conditions and actions to take in case of fire.
- Explain combustion, and identify three conditions necessary for it to occur.
- Describe fire prevention in agricultural power, structural, and technical systems.
- Explain classes of fires and appropriate extinguishers.
Standard 4
Take appropriate actions in an accident or emergency.

- Demonstrate the use of simple first aid in an accident with an injury.
- Locate first-aid kits, and investigate their contents and use in power, structural, and technical systems settings.
- Discuss appropriate safety responses in an accident or emergency.

Performance Objective
- Demonstrate safe practices when working in laboratories.

STRAND 5
Students will plan, construct, and appropriately maintain agricultural structures.

Standard 1
Create and/or use sketches, plans, and specifications for agricultural structures.

- Identify symbols and drawing techniques used in creating sketches and plans.
- Use scale measurement and dimensions with sketches and plans.
- Identify and interpret different views of a construction drawing.
- Develop sketches or plans for an agricultural structure.

Standard 2
Determine materials for agricultural structures.

- Identify types and grades of materials used in constructing agricultural structures, including lumber, plywood, manufactured materials (e.g. particle board and wafer board), roofing, insulation, and doors and windows.
- Identify fasteners and other devices used in constructing agricultural structures.
- Identify dimensions and sizes of materials and fasteners used in agricultural structures.

Standard 3
Construct a small agricultural structure or project.

- Identify and demonstrate safe and proper use of common tools used in agricultural construction.
- Select materials for a construction project.
- Prepare a bill of materials for a small structure or project, including a cost estimate.
- Measure, mark, and cut materials according to plans for an agricultural structure.
- Assemble an agricultural structure by properly fitting materials and using fasteners.
- Evaluate a completed structure in terms of plans and quality of work.
Standard 3
Select and use appropriate protective coatings, such as paints and preservatives.

• Discuss the importance of properly selecting and using paints and preservatives.
• Identify and use appropriate application methods for coating materials, including surface preparation and safety.
• Maintain painting tools and equipment by proper cleaning, storage, and on-job use.

Performance Objective

• Measure land with tape and/or instruments.

STRAND 6
Students will demonstrate basic plumbing knowledge and skills.

Standard 1
Distinguish plumbing materials and products.

• Describe the meaning and importance of plumbing systems for air, water, wastes, and other fluid-based materials.
• Identify components of plumbing supply systems and waste systems, including pipe, tubing, valves, faucets, fittings, and fixtures.
• Identify materials used in manufacturing plumbing materials, such as plastics (PVC and CPVC), copper, iron, and steel.
• Describe how plumbing system components are sized, and appropriately match sizes to jobs.
• Prepare a bill of materials for a plumbing job.

Standard 2
Perform simple plumbing jobs.

• Identify and select appropriate tools for a plumbing job.
• Measure, cut, fit, and install PVC and/or CPVC materials as used in water supply systems, including use of cleaner and cement.
• Measure, cut, thread, and install iron or steel pipe materials as used in water supply systems.
• Demonstrate the use of soldering in plumbing applications.
• Repair and maintain plumbing systems.

Performance Objective

• Install and/or repair plastic pipe and fittings.
• Install and/or repair galvanized steel pipe and fittings.
STRAND 7

Students will select, operate, maintain, and repair small internal combustion engines.

Standard 1
Select and operate internal combustion engines.

- Identify components and systems of internal combustion engines.
- Describe the operation of internal combustion engines by cycle and fuel used.
- Use the operator’s manual to operate and maintain an engine properly.
- List and explain criteria to use in selecting an engine.
- Obtain and/or prepare the proper fuel for an internal combustion engine.
- Start, operate, and shut down an internal combustion engine.

Standard 2
Analyze and troubleshoot internal combustion engines.

- Identify the major components of internal combustion engines and the functions of each.
- Explain the meaning of troubleshooting, and list the common engine problems identified/solved by troubleshooting.

Standard 3
Maintain internal combustion engines.

- Perform routine maintenance, such as cleaning an engine, changing the oil, and cleaning or replacing the air filter.
- Replace and adjust spark plugs as needed.
- Winterize or otherwise prepare an engine for extended storage.
- Practice environmental responsibility through the proper disposal of engine wastes, such as oil and filters.

Standard 4
Operate small equipment powered by internal combustion engines.

- Identify safety hazards and practices to follow to assure safe operation with small equipment, including mowers, tillers, blowers, and edgers.
- Explain the meaning and importance of pre-operation inspections, including those of fuel and oil levels, the air system, and the condition of engine components.
- Start and safely operate engine-powered equipment.
- Stop and properly cool down and store engine-powered equipment.

Performance Objective

- Use, classify, and service small gas engines.
- Start, operate and shut down a small gas engine.
STRAND 8

**Students will fabricate with metal.**

**Standard 1**

Explain kinds of metals and their uses.
- Identify kinds of metals by appearance and testing, such as spark testing.
- Classify metals according to characteristics and uses.
- Identify, maintain, recondition, and use tools in hot and cold metal work.

**Standard 2**

Fabricate with hot and cold metal.
- Insert indicator text
- Insert indicator text
- Insert indicator text Select and use appropriate safety practices in metal fabrication.
- Apply cold metal processes in fabrication, including measuring and marking, cutting, bending, tapping and threading, filing and drilling, and riveting.
- Discuss the use of hot metal processes, including annealing, tempering, bending, cutting, and hole punching.

**Standard 3**

Use shielded metal arc welding (SMAW) processes.
- Set up for SMAW operations on carbon steel.
- Start and restart an arc and backfill at the edge while running a bead on carbon steel.
- Build a weld pad on carbon steel in the flat position.
- Make 1F (flat position-fillet weld) welds on carbon steel.
- Make 2F (horizontal position-fillet weld) welds on carbon steel.
- Make 1G (flat position-groove weld) welds on carbon steel.
- Make 2G (horizontal position-groove weld) welds on carbon steel.

**Standard 4**

Use manual oxyfuel gas cutting processes.
- Perform safety inspections of equipment and accessories.
- Set up for manual oxyfuel gas cutting operations on carbon steel.
- Perform straight cutting operations on carbon steel.
- Perform shape-cutting operations on carbon steel.
- Perform bevel-cutting operations on carbon steel.
- Pierce a hole through a carbon steel plate.

**Standard 5**

Use gas metal arc welding (GMAW) processes.
- Set up for GMAW operations on carbon steel.
- Start and restart an arc and backfill at the edge while running a bead on carbon steel.
- Use Short Circuit Transfer welding process to make 1F (flat position-fillet weld) welds on carbon steel.
• Use Short Circuit Transfer welding process to make 2F (horizontal position-fillet weld) welds on carbon steel.
• Use Short Circuit Transfer welding process to make 1F (flat position-fillet weld) multi-pass weld on carbon steel.
• Use Short Circuit Transfer welding process to make 1G (flat position-groove weld) welds on carbon steel.
• Use Short Circuit Transfer welding process to make 2G (horizontal position-groove weld) welds on carbon steel.

Performance Objective
• Setup, test, and adjust oxyacetylene welding/cutting equipment.
• Cut various thickness of mild steel with an oxyacetylene cutting torch.
• Start up, adjust and shut down electric welding equipment for welding various metals, joints, and material thicknesses.
• Prepare metal for welding.
• Fabricate shop projects using metal.
• Demonstrate proper use of safety practices when fabricating and/or installing metal materials.

Skill Certificate Test Points by Strand

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