7.0 Apply scientific skills and principles in power, structure, and technical systems: Students who demonstrate learning can:

Power, structure, and technical systems the infrastructure that allows for advanced in agriculture and natural resources. While there are advancements in the broad field of power, structural, and technical systems the ones specifically related to agricultural and natural resource systems are pertinent to this course. There are historical technologies that have led to significant advancements in agriculture. The invention of barbed wire had a major impact on the expansion westward and helped shaped how food animals are raised in the United States. The innovations of today will have a major impact on the future of how we feed our growing population and manage the resources we have.

- 7.01 Analyze trends and emerging technological advances in power, structure, and technical systems.

Major trends to explore-

- Automated practices- Self driving tractors/sprayers/harvesters, automated and mechanical harvesting, automated processing
- Improved monitoring- use of satellite, GPS, LIDAR, and Infrared to monitor water usage, crop health, number of animals in an ecosystem, change of environmental conditions, use of large data sets and longitudinal data to monitor changes over time
- Changes to fuel systems for food production and processing- A major cost in producing food is related to fuel costs, both in farm equipment and transportation of raw materials and finished products. As technologies develop, fuel savings and alternative fuel sources will help manage these expenses for producers
- Precision agriculture- Through the use of GPS, laser leveling, and other precise application measures, the use of precision agriculture will allow for food and fiber production that uses fewer inputs, increases yields, and has a lighter impact on the surrounding environment.

- 7.02 Select the appropriate tool for construction, repair, and maintenance of power, structure, and technical systems.

Basic Tool List-
Taken from National FFA Tool ID List

Driving tools-

Ball-peen hammer: Has 2 heads; one flat, one rounded. Typically used for metalworking.
(nail hammer) Claw Hammer: Typically used in carpentry for driving or pulling nails from wood.
Rubber Mallet: Used for general purposes where a softer strike is necessary.
Turning Tools-
Allen wrench: AKA hex key: For applications where an extremely precise fit is necessary to prevent rounding off.
Box end wrench: Used to provide grip when tightening or loosening fasteners such as nuts and bolts.
Cordless Drill: Usually battery powered, useful for boring holes and tightening or loosening fasteners.
Phillips screw driver: Hand tool for driving screws with a pointed head.
Regular socket: Attaches to a ratchet and tightens or loosens fasteners.
Deep well socket: Similar to regular socket, but deeper to allow for longer fasteners.

Cutting tools-
Aviation snips: Also known as shears, used to cut thin metal.
Bolt cutters: Used to cut bolts, chain, padlocks, rebar, and other thick metals.
Fence pliers: Multifaceted tool used to drive staples and twist and cut wire.
Side cutting pliers: Pliers used for cutting rather than holding.
Hack saw: Saw with a narrow, fine-toothed blade, typically used for cutting metal.

Clamping and holding tools-
C Clamp: Used to hold metal or wood objects still while working with them.
Groove joint pliers: Also known as adjustable pliers or Channellock, the jaw can be adjustable to grip many different objects.
Long nose pliers: Also known as needle nose pliers, useful for reaching into small areas where fingers or other pliers cannot reach.
Ratchet strap: Typically made from polyester, the ratchet mechanism holds the strap tight to keep loads secure.
Vice grip pliers: Also known as locking pliers, can be locked into position to firmly clamp items.

Punches and Chisels-
Pen Punch: Generally used to remove bolts or pins from a hole.
Center Punch: Generally used to mark the center point of an item.
Cold Chisel: Used to remove waste to create a smooth finish of an item.

Countersink: Applied to a hole to allow a screw or nail to sit level with the item.

Measuring tools-
Combination square: Square that can mark 45 or 90 degree angles.
Framing square: Used by carpenters to lay out structures that need perfect right angles.
Tape rule: Also known as a tape measure. Used to measure distance.
Tire gauge: Portable gauge used to measure air pressure in a tire.
Try Square: Used for marking 90 degree angles on wood.

Fasteners and Nails-
Carriage Bolt: Large bolt with a round head usually used to fasten wood together.
Common nail: Construction fastener used to attach wood.
Eye bolt: Bolt with a loop on one end.
Finishing nail: Typically small nails that leave small holes that can be covered.
Flathead screw: Fastener with a flat head, can be Phillips or slotted.
Roofing Nail: Nail used to install roofing.
Sheet metal screw: Used for sheet metal, characterized by threading covering the entire shank.

Electrical Tools-
Duplex receptacle: Type of electrical outlet with two receptacles or outlets for plugs.
Single pull switch: Also known as single pole switch, a switch that controls lights or other fixtures with only one output wire.

Safety tools-
Dust mask: Paper pad held over the nose and mouth by elastic or rubber bands.
Safety glasses: Used to protect the eyes when using tools, either hand or power.
Safety goggles: Protective eyewear that protects the eyes from flying debris.
Welding gloves: Designed to protect the hands from heat, flame, and shock.

Plumbing-
Hose bib: Usually an outdoor faucet that connects to water pipes inside the home.
PVC Cutter: Tool used by plumbers to cut pipe.
Pipe wrench: Used to tighten or loosen pipe.

- 7.03 Demonstrate safe use of common tools used for construction, repair, and maintenance of power, structure, and technical systems.

https://www.osha.gov/hand-power-tools

Basic Safety Rules-

1- Use the right tool for the job.
2- Do not use broken or damaged tools
3- Keep tools in
4- Make sure you are in a secure position when using tools
5- Hand a tool to others using the handle portion (never toss or throw a tool)
6- Operate the tools in a safe direction (try to position the tool away from your body)

This standard should focus on use of tools. Example rubrics will be provided for common tools. Small projects that can be completed with hand tools would be ideal for this standard.

Hammer:

1. Safety: Always wear PPE and be aware of your surroundings.
2. Grip: Hold the hammer firmly with your dominant hand.
3. Swing: Aim hammer at the center of what you are driving and swing straight down.
4. Accuracy: Aim for the center of the object you are driving and make solid contact.
5. Control: Use a controlled swing to avoid damaging the piece you are working on or yourself.

Cordless Drill:

1. Safety: Always wear PPE and ensure your workspace is clean.
2. Battery: Ensure battery is charged enough to complete the task.
3. Chuck: Insert the drill bit and use the chuck to ensure it is tight.
4. Speed: Select an appropriate speed for your application.
5. Grip: Hold the drill firmly.
6. Accuracy: Aim for the center of where you want to drill the hole.
7. Pressure: Apply steady, even pressure.
8. Depth: Ensure you drill to the correct depth.

C-Clamp:

1. Safety: Always wear PPE and ensure your workspace is clean.
2. Size: Choose the appropriate size clamp for the job.

3. Positioning: Position the C-Clamp to ensure the most secure hold.
4. Tightening: Tighten the C-Clamp until the piece is secure.
5. Alignment: The clamp should be straight and centered over the piece.
6. Control: Use controlled force to avoid damage to the piece or yourself while working.
7. Release: Turn the C-Clamp the opposite direction to loosen.

- 7.04 Utilize commonly used technologies in AFNR systems to solve problems in AFNR systems.

What problems in AFNR have been solved with technology?

- Overuse/misapplication of pesticides:

-Using GPS sprayers: Farmers can apply exactly what they need exactly where they need it.
-GPS calibrated soil testing: Provide precise soil testing data.
automatic sprayers for precise use of fertilizer: Precisely apply product and reduce labor cost.

- Barbed Wire: Enclosed land, control grazing, improve efficiency, and increase safety to allow for the expansion of agriculture.

- 7.05 Manage power, structure, and technical systems facilities, equipment and supplies with a safety mindset.

This will be dependent on the facilities at your disposal. An emphasis should be placed on maintenance and cleanliness for safety.

Safety mindset- Having a continuous awareness of the level of risks to yourselves and those around you when working in an agriculture or natural resource setting.

- Scanning and monitoring- Taking a 15 seconds or so at a set interval (every 30 minutes) to look around for potential hazards.
- Hazards include-
    - Tripping hazards- cords, tools, or other materials on the ground
    - Fire hazards- An access of any of the three areas of the fire triangle (heat, fuel, oxygen)
    - Falling hazards- Heavy or unsecured objects overhead that pose a risk
    - Excess clutter- Too many extra materials around a worksite can present a hazard
    - Tools and other items in disrepair- Tools that are not in their optimal condition can cause a hazard (example, a knife that is not as sharp

as it needs to be could cause the user to push too hard on the cutting surface)
    - Unfocused and distracted behavior- If individuals are distracted by horseplay or are not focused on the task at hand (on their phone), they may be exposed to a hazard
- Cleaning and maintenance should occur at regular intervals-
    - Daily or after each use- Clean up area, do a quick check of tools, report any issues
    - Monthly- Complete a more thorough cleaning, complete schedule maintenance and perform needed repairs.
    - Quarterly- Complete a thorough cleaning, moving items and cleaning behind and in between spaces

- 7.06 Explore employment and entrepreneurship opportunities in power, structure, and technical systems.
    - Careers in ag technology include engineering, data science, robotics, and agronomy. If you are interested in cutting-edge technology, these careers are for you!