

# SOPHOMORE AGRICULTURAL ENGINEERING CURRICULUM



**Grade Level(s):** 10

**Curriculum Author(s):** Andrew Zielinski

**Course Description:** *Students enrolled in the Sophomore Ag Engineering Curriculum will be exposed to a wide variety of topics including precision measurement, outdoor construction, machinery maintenance and operation, small engines, introduction to welding, and agricultural electrical utilities.*

### Year At A Glance

| Unit Title                                          | Overarching Essential Question                                                     | Overarching Enduring Understanding                                                                                                                                              | <a href="#">Vision of A Learner Attribute and Indicator</a> |
|-----------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| <a href="#">Precision Measurement</a>               | How does precision measurement relate to engine mechanics?                         | Students will understand that precision measurement allows exact computation of clearances, size, bolt threads, and distances that are essential to engine efficiency.          | CCE3(9-12); DE4(9-12); TI3(9-12); AA2(9-12)                 |
| <a href="#">Outdoor Construction</a>                | How can mathematical principles be applied to construction?                        | Students will understand that properly squaring and leveling a building stakeout allows for an accurate and stable base to construct a structure                                | TCC4, CCE3, DE4, TI1, TI3, P1                               |
| <a href="#">Machinery Maintenance and Operation</a> | Why is preventative maintenance important?                                         | Students will understand that preventative maintenance ensures equipment longevity, decreased cost over time, and protection of equipment during seasonal changes               | TCC4, CCE3, DE4, TI1, TI3, P1, AA2, AA3                     |
| <a href="#">Small Engines</a>                       | Why is four stroke theory important to understanding preventative maintenance?     | Students will understand how an engine operates and identify common sources of failure in an engine                                                                             | TCC4, CCE3, DE4, TI1, TI3, P1, AA2, AA3                     |
| <a href="#">Introduction to Welding</a>             | How does understanding of individual welding processes increase welding technique? | Understanding how welding works increases technique by decreasing porosity, creating optimal penetration, correctly balancing heat transfer and increasing overall weld quality | TCC4, CCE3, DE4, TI1, TI3, P1, AA2, AA3                     |



|                                         |                                                                 |                                                                                                              |                                         |
|-----------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| <a href="#">Ag Electrical Utilities</a> | Why is it important to read and understand electrical diagrams? | Measuring and rating electricity helps with application of proper electrical devices and limits safety risks | TCC4, CCE3, DE4, TI1, TI3, P1, AA2, AA3 |
|-----------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------|

| Unit 1 - Shop Safety & Precision Measurement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                  |
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| Desired Results - Goals, Transfer, Meaning, Acquisition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                  |
| <p><b>Established Goals:</b></p> <p><b>Pathway Content Standard:</b> The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.</p> <p><b>Performance Element:</b> PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.</p> <p><b>Performance Indicator:</b> PST.01.0 - Apply physical science laws and principles to identify, classify, and use lubricants.</p> <p><b>Performance Indicator:</b> Identify and use hand and power tools and equipment for service, construction, and fabrication</p> <p><b>PST.01.02.01.c.</b> Select, use and dispose of lubricants according to local, state, and federal regulations</p> <p><b>PST.01.02.01.b.</b> Maintain and repair tools used in agricultural mechanics</p> |                                                                                                                                                                                                                  |
| <p><b>Vision of A Learner Attributes:</b> Students will be able to independently use their learning to...</p> <ul style="list-style-type: none"> <li>• CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.</li> <li>• DE4(9-12): I can work respectfully with all members of my community and support the needs of others.</li> <li>• TI3(9-12): I can formulate and investigate probing questions to further my learning.</li> <li>• AA2(9-12): I can assess my past successes and mistakes to change my approach.</li> </ul>                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                  |
| <p><b>Understandings:</b></p> <ul style="list-style-type: none"> <li>• A well-organized, and well-maintained shop ensures effective use of time and increased longevity of equipment.</li> <li>• Precision measurement allows exact computation of clearances, size, bolt threads, and distances that are essential to engine efficiency.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p><b>Essential Questions:</b></p> <ul style="list-style-type: none"> <li>• Why is shop maintenance and organization important?</li> <li>• How does precision measurement relate to engine mechanics?</li> </ul> |
| <p><b>Students will know...</b></p> <ul style="list-style-type: none"> <li>• How to select, use, and dispose of lubricants according to local,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p><b>Students will be able to...</b></p> <ul style="list-style-type: none"> <li>• Demonstrate knowledge of local, state, and federal regulations</li> </ul>                                                     |

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| <ul style="list-style-type: none"> <li>state, and federal regulations.</li> <li>How to maintain and repair tools used in agricultural mechanics</li> <li>How to properly maintain and organize and clean the shop equipment and facility</li> <li>How to read a vernier caliper to the hundredths of an inch</li> <li>How to tap and die a threaded hole for a particular bolt</li> </ul>                                    | <ul style="list-style-type: none"> <li>and properly dispose of lubricants in the shop (oils, cleaners, etc...)</li> <li>Maintain and repair tools used in agricultural mechanics</li> <li>Organize and maintain a clean and organized shop</li> <li>Read the measurement of a bolt using a vernier caliper to the hundredths of an inch</li> <li>Utilize the tap drill chart, caliper, and proper shop tools to tap and die a threaded hole for a particular bolt</li> </ul> |
| <b>Key Vocabulary:</b> caliper, vernier scale, micrometer, tap, die, bolt length, thread length, body length, fine thread, coarse thread, root, crest, thread count, torque                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Assessment Evidence</b>                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Performance Tasks:</b><br><br><i>Summative: Bolt Tap &amp; Die Activity (Shop) AA3, P1</i> - Students demonstrate the correct way to tap and die a threaded hole for a particular bolt in a piece of flat steel. Included precision measurement, fraction to decimal conversion, correct use of power tools and tap & die set.                                                                                            | <b>Other Evidence:</b><br><br>Classwork: Bolt Measurement Exercise (utilize caliper and thread pitch gauge to measure assigned bolts) <b>DE4</b><br><br>Interim: Measurement Quiz (terminology, bolt grading, using the caliper)<br><br>Classwork: Tap Drill Chart Assignment (practice using the tap drill chart to determine tap drill size)                                                                                                                               |
| <b>Learning Plan</b>                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. <b>DE4, CCE3</b></li> <li>Learn precision measurement terminology and identify precision measurement tools <b>TI3</b></li> <li>Use a caliper, thread pitch gauge, and tap drill chart to drill and tap a threaded hole. <b>AA2</b></li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Teacher Resources:</b> <i>Steps to Reading a Caliper notes; Bolt Handout (With Tap Drill Chart) - notes for students; Fundamental of Service - John Deere - FOS60 - Fasteners</i>                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## Unit 2 - Outdoor Construction

### Desired Results - Goals, Transfer, Meaning, Acquisition

#### Established Goals:

**Pathway Content Standard:** The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.

**Performance Element:** PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.

**Performance Indicator:** PST.05.04. Follow architectural and mechanical plans to construct agricultural buildings and facilities.

**Performance Indicator:** CT-PST.05.02. Apply structural plans, specifications, and building codes

**Vision of A Learner Attributes:** Students will be able to independently use their learning to...

#### **TCC: THINK CRITICALLY AND CREATIVELY –**

TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

#### **CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –**

CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

#### **DE: DEMONSTRATE EMPATHY –**

DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

#### **TI: TAKE INITIATIVE –**

TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.

TI3(9-12): I can formulate and investigate probing questions to further my learning.

#### **P: PERSEVERE –**

P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

#### Understandings:

- Mathematical principles are integral to construction as they enable precise measurements, efficient use of resources, and adherence to design specifications, ensuring the functionality, safety, and cost-effectiveness of agricultural and structural projects. By applying concepts such as geometry, ratios, and algebra, students can create accurate plans, estimate costs,

#### Essential Questions:

- How can mathematical principles be applied to construction?
- Why is leveling and squaring important to building layout?

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| <p>and optimize materials for sustainable and effective construction.</p> <ul style="list-style-type: none"> <li>• Properly squaring and leveling a building stakeout allows for an accurate and stable base to construct a structure</li> </ul>                                                                       |                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Students will know...</b></p> <ul style="list-style-type: none"> <li>• How to operate basic land surveying equipment</li> <li>• How to complete a building stake-out based on Pythagorean Theorem and by using a transit</li> <li>• How to utilize agricultural plans/drawings and measure accurately</li> </ul> | <p><b>Students will be able to...</b></p> <ul style="list-style-type: none"> <li>• Identify and operate basic land surveying equipment</li> <li>• Complete a building stake-out using both pythagorean theorem and provided surveying equipment</li> <li>• Interpret agricultural plans and measure accurately</li> </ul>                                  |
| <p><b>Key Vocabulary:</b> transit, survey staff, batter-board, plumb bob, acre, leveling, squaring, benchmark</p>                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                            |
| <p style="text-align: center;"><b>Assessment Evidence</b></p>                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Performance Tasks:</b></p> <p><i>Summative: Batter Boards</i> - Students will properly square and level a building stake-out along with installing batter boards and leveling strings. This process reflects industry required techniques and real-world applications.</p>                                       | <p><b>Other Evidence:</b></p> <p>Classwork: Understanding Reading a Rod (becoming more familiar with reading the survey staff)</p> <p>Interim: Surveying Quiz (terminology, tools, uses for survey)</p> <p>Classwork: Survey Staff Practice (becoming more familiar with reading the survey staff)</p> <p>Classwork: Area Worksheet (determining area)</p> |
| <p style="text-align: center;"><b>Learning Plan</b></p>                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                            |
| <ul style="list-style-type: none"> <li>• Demonstrate proper use of surveying equipment to do differential leveling, calculate areas, and batter boards. <b>DE4, CCE 3</b></li> <li>• Learn precision land measurement and identify surveying tools <b>TI3</b></li> </ul>                                               |                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Teacher Resources:</b> Cooper, Elmer. <u>Agricultural Mechanics: Fundamentals and Applications</u>. 2nd Edition. Delmar Publishers Inc. 1992</p>                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                            |

## Unit 3 - Machinery Maintenance & Operation

### Desired Results - Goals, Transfer, Meaning, Acquisition

#### Established Goals:

**Pathway Content Standard:** The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.

**Performance Element:** PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.

**PST.01.01.01.a.** Classify lubricants by source, sustainability, and equipment capability

**PST.01.01.01.b.** Classify lubricants by SAE viscosity and API service classifications

**PST.02.01.01.a.** Identify and schedule power unit and equipment lubrication

**PST.02.02.01.a.** Operate and maintain agricultural machinery and power systems

**PST.02.02.01.b.** Use operator/service/technical manuals utilized in agriculture mechanics

**Vision of A Learner Attributes:** Students will be able to independently use their learning to...

#### **TCC: THINK CRITICALLY AND CREATIVELY –**

TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

#### **CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –**

CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

#### **DE: DEMONSTRATE EMPATHY –**

DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

#### **TI: TAKE INITIATIVE –**

TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.

TI3(9-12): I can formulate and investigate probing questions to further my learning.

#### **P: PERSEVERE –**

P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

**AA: ADAPT AND ADJUST –**

AA2(9-12): I can assess my past successes and mistakes to change my approach.

AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

**Understandings:**

- Preventative maintenance ensures equipment longevity, decreased cost over time, and protection of equipment during seasonal changes

**Essential Questions:**

- Why is preventative maintenance important?

**Students will know...**

- How to identify proper lubricants and fluid capacities using the operators/service/technical manual
- How to operate and maintain agricultural machinery and power systems
- How to identify and verify the presence of safety systems and hardware on tools and equipment
- How to verify fluids are at the appropriate levels on a piece of equipment

**Students will be able to...**

- Perform a 100hr increment service on an assigned piece of equipment
- Operate a school-owned piece of equipment safely
- Verify a piece of equipment is safe to operate by completing a pre-operation check and ensuring safety systems are present

**Key Vocabulary:** radiator, coolant, hydraulic oil, engine oil, drain plug, load tester, SMV (slow moving vehicle), Zerk, coolant tester, acid tester, terminal, hydraulic filter

**Assessment Evidence****Performance Tasks:**

Interim: Maintenance Documentation (Students complete summary of work completed to be put into maintenance binders and kept according to industry standards)

**Other Evidence:**

Classwork: Operators Manual Lookup (researching technical data, is also how students keep track of maintenance data in the shop)

Classwork: Equipment Maintenance Background Wksht (bellringer/lead-in to equipment maintenance)

### Learning Plan

- Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. **DE4, CCE3**
- Identify and schedule power unit and equipment lubrication. **DE4**
- Operate and maintain agricultural machinery and power systems **TI3, TCC4**

#### Teacher Resources:

Equipment Manuals for school tractors/equipment (print & digital copies)

Filter Numbers Binder

## Unit 4 - Small Engines

### Desired Results - Goals, Transfer, Meaning, Acquisition

#### Established Goals:

**Pathway Content Standard:** The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.

**Performance Element:** PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.

**CT-PST.03.01** Troubleshoot a repair internal combustion engines

**PST.01.02.02.a.** Identify and explain the appropriate use of tools used in agricultural mechanics

**PST.01.02.01.b.** Maintain and repair tools used in agriculture mechanics

**PST.02.02.01.a.** Operate and maintain agricultural machinery and power systems

**PST.02.02.01.b.** Use operator/service/technical manuals utilized in agricultural mechanics

**PST.02.02.02.b.** Explain the safe operation of agricultural tractors and related agricultural equipment

**PST.03.01.01.a.** Identify components and systems of internal combustion engines

**PST.03.01.01.b.** Utilize technical manuals and computer-based diagnostics in engine analysis and repair

**Vision of A Learner Attributes:** Students will be able to independently use their learning to...

#### **TCC: THINK CRITICALLY AND CREATIVELY –**

TCC4: Transfer new learning and skills to other contexts and settings beyond the classroom.

TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

#### **CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –**

CCE3: Lead group progress through active listening, questioning, and giving advice.

CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

#### **DE: DEMONSTRATE EMPATHY –**

DE4: Are inclusive and help others in need.

DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

#### **TI: TAKE INITIATIVE –**

TI1: Organize time to set goals and devise plans.

TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.

TI3: Ask questions to direct learning and self-advocate.

TI3(9-12): I can formulate and investigate probing questions to further my learning.

**P: PERSEVERE –**

P1: Identify and utilize personal strengths to overcome obstacles.

P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

**AA: ADAPT AND ADJUST –**

AA2: Reflect on prior experiences to recall successful pathways and strategies.

AA2(9-12): I can assess my past successes and mistakes to change my approach.

AA3: Cope with unanticipated changes and maintain a productive attitude.

AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

**Understandings:**

- Understanding the four-stroke theory is essential for recognizing how internal combustion engines operate, which aids in diagnosing potential problems and implementing effective preventative maintenance strategies to enhance engine performance and longevity.
- Proficiency in selecting and using appropriate tools and understanding engine components is critical for the accurate disassembly and reassembly of engines, ensuring operational safety, reliability, and adherence to technical standards.

**Essential Questions:**

- Why is four stroke theory important to understanding preventative maintenance?
- What tools and parts are needed to properly disassemble and reassemble an engine?

**Students will know...**

- Students will know how to utilize technical manuals to look up specifications to assist in engine disassembly/reassembly
- Students will know the components and systems of internal combustion engines
- Students will know the tools used used in engine disassembly/reassembly

**Students will be able to...**

- Lookup engine specifications to assist in engine disassembly/reassembly
- Identify the components and systems of internal combustion engines
- Identify small engine tools
- Disassemble/reassemble an engine according to factory

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| <ul style="list-style-type: none"> <li>Students will know how to disassemble/reassemble an engine according to factory specification</li> </ul>                                                                                                                                                                                                                                                                                | specifications                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Key Vocabulary:</b> carburetor, fuel tank, governor, compression, air filter, valves, piston, rings, crankshaft, connecting rod, muffler, ignition, coil/armature, spark plug, camshaft, shut-off switch(es), crankcase, oil, oil filter, flywheel, cooling fins, torque, lapping                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Assessment Evidence</b>                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Performance Tasks:</b><br><br>Students will successfully disassemble and reassemble a Briggs & Stratton OHV small engine. Graded with a Checklist<br><br>Summative: Small Engines Test (written)                                                                                                                                                                                                                            | <b>Other Evidence:</b><br><br>Classwork: Four Stroke Theory Worksheet while watching Briggs & Stratton Four Stroke Theory video<br><br>Classwork: Parts ID & Functions worksheet<br><br>Interim: Four Stroke Theory<br><br>Classwork: Small Engines Systems worksheet - organize parts into the appropriate systems based on the parts function<br><br>Classwork: Small Engines Review Sheet |
| <b>Learning Plan</b>                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. <b>DE4, CCE3</b></li> <li>Explain four stroke theory and the parts that make up a small engine <b>P1</b></li> <li>Successfully disassemble and reassemble a Briggs &amp; Stratton small engine to factory specifications <b>CCE3</b></li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Teacher Resources:</b><br><br><i>Briggs &amp; Stratton - Single Cylinder OHV Repair Manual</i><br><br><i>Briggs &amp; Stratton Power Portal (Online Resource) <a href="https://www.thepowerportal.com/">https://www.thepowerportal.com/</a></i>                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                              |

## Unit 5 - Introduction to Welding

### Desired Results - Goals, Transfer, Meaning, Acquisition

#### Established Goals:

**Pathway Content Standard:** The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.

**Performance Element:** PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.

**PST.01.02.01.b.** Maintain and repair tools used in agricultural mechanics

**PST.01.02.01.c.** Assess the performance of self and/or peers in use of hand and power tools to safely and efficiently service, construct, and fabricate quality products

**PST.02.02.01.a.** Operate and maintain agricultural machinery and power systems

**PST.05.01.01.a.** Identify kinds and characteristics of metal materials

**PST.05.05.02.a.** Identify personal protective equipment (PPE) used in welding

**PST.05.05.02.b.** Demonstrate how to safely setup, use, and turn off oxy-acetylene welding equipment

**PST.05.05.03.a** Demonstrate how to safely set up, use, and turn off shielded metal arc welding (SMAW) equipment

**PST.05.05.04.a.** Demonstrate how to safely set up, use, and turn off a gas metal arc welding (GMAW) system

**Vision of A Learner Attributes:** Students will be able to independently use their learning to...

#### **TCC: THINK CRITICALLY AND CREATIVELY –**

TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

#### **CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –**

CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

#### **DE: DEMONSTRATE EMPATHY –**

DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

#### **TI: TAKE INITIATIVE –**

TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.

TI3: Ask questions to direct learning and self-advocate.

TI3(9-12): I can formulate and investigate probing questions to further my learning.

**P: PERSEVERE –**

P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

**AA: ADAPT AND ADJUST –**

AA2(9-12): I can assess my past successes and mistakes to change my approach.

AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

**Understandings:**

- A safe environment prevents injuries, protects equipment and the environment, and increases productivity
- Understanding how welding works increases technique by decreasing porosity, creating optimal penetration, correctly balancing heat transfer and increasing overall weld quality

**Essential Questions:**

- How is understanding safe protocol important when using welding equipment?
- How does understanding of individual welding processes increase welding technique?

**Students will know...**

- How a welding shop needs to be set up in order to complete all welding processes safely
- What personal protective equipment (PPE) is needed in order to weld safely
- How to set up, use, and turn off oxygen/acetylene equipment
- How to set up, use, and turn off SMAW equipment
- How to set up, use, and turn off GMAW/FCAW equipment

**Students will be able to...**

- Identify potential hazards in the shop and correct them when setting up a safe welding shop
- Identify and wear appropriate clothing and PPE for welding
- Perform basic welding strategies with oxygen/acetylene torches
- Perform basic arc (stick or SMAW) welding methods with a variety of welding electrodes
- Perform basic FCAW & GMAW (wire-feed) welding

**Key Vocabulary:** melting point, molten puddle, fusion, gas shield, inner cone, oxidizing flame, reducing flame, flagging flame, neutral flame, Gas Metal Arc Welding (GMAW), Flux Core Arc Welding (FCAW), acetylene, arc length, electrode, flux, alternating current (AC), direct current (DC), lap joint, tee joint, butt joint, corner joint, edge joint

### Assessment Evidence

#### Performance Tasks:

Students will complete three welding joints (butt, lap, and tee-joint) for each welding method. Student grades will be with checklist

#### Other Evidence:

Classwork: Introduction to Welding

Classwork: Oxy-Fuel cutting & welding notes

Interim: Shop Performance tasks (complete a weld using oxygen/acetylene, stick welding, and MIG welding processes)

Classwork: Stick welding notes

Classwork: MIG welding notes

### Learning Plan

- Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. **DE4, CCE3**
- Recognize what a safe welding shop looks like and take steps to ensure shop safety **P1**
- Successfully perform the following welding processes: oxygen/acetylene, stick welding, and MIG (wire-feed) welding **AA2, AA3, P1, TI1**

#### Teacher Resources:

[Lincoln Welding](#) & [Miller Welding](#) websites

*Teacher created*

## Unit 6 - Ag Electrical Utilities

### Desired Results - Goals, Transfer, Meaning, Acquisition

#### Established Goals:

**Pathway Content Standard:** The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.

**Performance Element:** PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.

**PST.04.03.01.a.** Define and measure amps, volts, and watts

**PST.04.03.02.a.** Identify the kinds and applications of electricity, including direct and alternating current

**PST.04.03.03.a.** Identify electrical measurements and make measurements calculations

**PST.04.03.06.a.** Describe the process of installing the following electrical circuits: duplex receptacle, single pole switch with light, and three-way switch with light

**PST.04.03.07.a.** Identify hazards and safety practices in planning, installing, and using electricity

**PST.o4.03.03.b.** Distinguish electrical circuits and components of each

**Vision of A Learner Attributes:** Students will be able to independently use their learning to...

#### **TCC: THINK CRITICALLY AND CREATIVELY –**

TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

#### **CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –**

CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

#### **DE: DEMONSTRATE EMPATHY –**

DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

#### **TI: TAKE INITIATIVE –**

TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.

TI3(9-12): I can formulate and investigate probing questions to further my learning.

#### **P: PERSEVERE –**

P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

**AA: ADAPT AND ADJUST –**

AA2(9-12): I can assess my past successes and mistakes to change my approach.

AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

**Understandings:**

- A safe environment prevents injuries, protects equipment and the environment, and increases productivity
- Understanding an electrical diagram allows safe installation of electrical devices
- Measuring and rating electricity helps with application of proper electrical devices and limits safety risks

**Essential Questions:**

- Why is safety during electrical work important?
- Why is it important to read and understand electrical diagrams?
- Why should you be able to quantify electricity?

**Students will know...**

- How to define and measure electricity, including amperage, volts, ohms, and watts
- How to identify different electrical systems and diagrams
- Types of wire and various electrical components
- Basic function of a DMM (Digital Multi-Meter)

**Students will be able to...**

- Explain amperage, volts, ohms, and watts
- Differentiate between AC (Alternating Current) and DC (Direct Current) circuits
- Select the right type of wire based on the application in which it is being used for
- Utilize a DMM (Digital Multi-Meter) to take basic measurements of an electrical circuit

**Key Vocabulary:** voltage, amperage, electrical potential, watt, ohm, AC (Alternating Current), DC (Direct Current), NM (Non-metallic romex), UF (Underground Feed), MC (Metallic cable - armored cable), load, DMM (Digital Multi-Meter)

**Assessment Evidence**

**Performance Tasks:**

Electrical Shop Activity - students will construct various circuits to current electrical code and test for functionality. Checklist used to grade.

**Other Evidence:**

Interim: electrical terminology, wire types, wire color coding

### Learning Plan

- Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. **DE4, CCE3**
- Explain terminology associated with electrical circuits, identify different types of wire and explain color coding, and take basic electrical measurements using a DMM (Digital Multi-Meter) **TCC4, CCE3**
- Construct and test various circuits to the current electrical code as a group **P1, DE4**

#### Teacher Resources:

*Electrical Wiring Exercises - ITCS Instructional Materials. University of Illinois: Vocational Agriculture*

*Teacher Created*