Agricultural Mechanics

Agriculture

Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course

Course Overview

This course includes surveying and legal land descriptions, heavy machinery operation and maintenance, concrete, framing and roofing, electrical wiring and plumbing.

Scope And Sequence

Timeframe	Unit	Instructional Topics
18 Day(s)	Surveying	1. Measurement and Area Conversion 2. Calculating Area 3. Methods of Measurement 4. Leveling 5. The Public Land Survey System (PLSS)
7 Period(s)	Heavy Machinery Operation and Maintenance	1. Take Control of Your Own Safety 2. Prepare for Safe Operation 3. Don't Get Crushed by Moving Parts 4. Prevent Rollover Accidents 5. Other Operational Hazards 6. Environmental Hazards 7. Safe Operation
10 Period(s)	Concrete	1. The Science of Concrete 2. Safety in Working with Concrete 3. Site Preparation 4. Concrete Tools 5. Pouring a Concrete Slab 6. Pouring Concrete Walls 7. Calculating the volume of Ingredients used for Concrete 8. Ordering Concrete
23 Day(s)	Framing	1. Construction Safety 2. Building Designs 3. Building Materials 4. Fasteners and Fastening Systems 5. Floors and Subfloors 6. Walls and Ceilings 7. Roof Framing 8. Roofing Materials
32 Period(s)	Electricity	1. Safety in Working with Electricity 2. Electrical Terminology 3. Wire Types and Uses 4. Grounding and GFCI Protection 5. Lights, Outlets, Switches, and circuit Protection 6. Electrical Symbols in Wiring Plans 7. Running Electrical Wiring 8. Connecting to the SEP 9. Running Wire from the SEP 10. Cost and Electrical Power Use
12 Period(s)	Plumbing	1. Water Needs 2. Plumbing Safety 3. Pipe types and Size Requirements 4. Measuring, Cutting, and Connecting Pipes
10 Day(s)	Fencing	1. Fencing Basics 2. Setting and Bracing Posts 3. Barbed and Woven Wire Fences 4. High Tensile and Electric Fences 5. Fence Mending Techniques

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50 Period(s)	Small Gas Engines	1. Safety 2. Introduction to Engines 3. Operational Theory of Compression 4. Parts and Tool Identification 5. Initial Engine Assessments 6. Disassemble to Valves (External Parts) 7. Engine Disassembly (Internal Parts) 8. Engine Measuring 9. Theory of Operation Ignition System 10. Operational Theory of Carburetion 11. Carburetor disassembly and re-assembly 12. Parts Ordering 13. Major Engine Failure Analysis 14. Rewind Starters 15. Machine Work 16. Re-Assembly 17. Starting Engines

Prerequisites

Ag Science II

Course Details

Unit: Surveying

Duration: 18 Day(s)

Unit Description

After completing this unit, students will show the ability to perform differential and profile leveling techniques and using the legal land description process for describing tracts of land.

Enduring Understandings (Knowledge & Skills)

After completing this unit, students will show the ability to perform differential and profile leveling techniques and using the legal land description process for describing tracts of land.

Academic Vocabulary

see attached
https://drive.google.com/drive/folders/0B4y_rnvRX-v_fjVpSEY3RnFhZ1UyTEdlNkJuQVlEb0NYQWp0VHN6QlFtMGVlY1pLRzdoYjA?resourcekey=0-XJWNiWzi9ZnWBNUn5f5UTg

Summative Assessment

Practical and Theoretical Exam

Topic: Measurement and Area Conversion

Duration: 1 Period(s)

Topic Description (short)

Solve measurement and area conversion problems.

Learning Targets

1. Explain common methods for determining the area of land.
2. Convert units of measurement and area.

Formative Assessment

Assignment Sheet 1

Topic: Calculating Area

Duration: 1 Period(s)

Topic Description (short)

Students will calculate the area of a field in both square feet and acres

Learning Targets

1. Apply the formulas for calculating area.
2. Solve problems using area formulas.

Formative Assessment

Assignment Sheet 2

Topic: Methods of Measurement

Duration: 2 Period(s)

Topic Description (short)

Students will utilize different methods of determining distance.

Learning Targets
1. Discuss methods for measuring distance including pacing, stadia, taping, odometer, and electronic distance measuring (EDM).
2. Measure distance by pacing, odometer, electronic distance measuring and taping.

Formative Assessment
Assignment Sheets 3 and 4

Topic: Leveling **Duration:** 8 Period(s)

Topic Description (short)
Students will utilize differential, profile, and topographic leveling techniques to determine elevation.

Learning Targets
1. Define backsight, forestight, benchmark, turning point, instrument height, elevation, rocking the rod, and balancing the sites.
2. Identify surveying equipment and parts.
3. Read a Philadelphia style rod with and without the target.
4. Discuss proper level and rod care and procedures.
5. Set up and adjust a three and four-legged leveling instrument.
6. Describe differential, profile and topographic leveling.
7. Identify topography map symbols.
8. Complete a set of surveyor's notes
9. Use a level to perform differential leveling.
10. Use a level to perform profile leveling.

Formative Assessment
Activity Sheets 5-10

Topic: The Public Land Survey System (PLSS) **Duration:** 6 Period(s)

Topic Description (short)
Students will utilize the PLSS to describe a parcel of land.

Learning Targets
1. Describe the Public Land Survey System (PLSS)
2. Determine the township for given cities.
3. Shade in the correct area of land given a description.
4. Write the legal land descriptions given a drawing.
5. Determine the number of acres in a field given the legal land description
6. Determine the cost of fencing given the legal land description.

Formative Assessment
Activity Sheets 11-14

Unit: Heavy Machinery Operation and Maintenance **Duration:** 7 Period(s)

Unit Description
This unit teaches important safety practices to use when operating or working near skid steer loaders. It is designed to use with hands-on safety training and the equipment operator's manual.

Enduring Understandings (Knowledge & Skills)
1. List the two most commonly reported causes of death from skid steer loaders.
2. Interpret the meaning of commonly posted warning signs.
3. Identify and locate safety related features you must check each day before start up.
4. Recognize how moving parts can crush you.
5. Identify safe work practices that protect you from being crushed.
6. Identify safe work procedures to avoid rollover accidents.
7. Describe what could happen when safety procedures are not followed.
8. Describe how to avoid collisions with obstacles, traffic and people.
9. Identify dangers from electricity, carbon monoxide, fuels and other fluids as well as falling material.
10. Identify environmental hazards.
11. Recognize treatment and first aid for exposure to environmental hazards.

Summative Assessment
Students will demonstrate safe operation of a skid steer loader on an obstacle course designed by an industry representative.

Materials and Resources (optional)
2 Skid steers from Sydenstrickers
Skid Steer Loader Safety Manual from K-State

Topic: Take Control of Your Own Safety **Duration:** 1 Period(s)

Topic Description (short)

Skid steer loaders can be dangerous if you do not observe certain safety precautions. Injuries and death are preventable. This lesson will teach you how to avoid such.

Learning Targets
1. List the two most commonly reported causes of death from skid steer loaders.
2. Interpret the meaning of commonly posted warning signs.

Formative Assessment
Lesson 1 Quiz Yourself.

Topic: Prepare for Safe Operation
Duration: 1 Period(s)

Topic Description (short)
Safety starts before the engine, Every day, you should check the skid steer to ensure it is safe for operation.

Learning Targets
1. Identify and locate safety related features you must check each day before start up.

Formative Assessment
Lesson 2 Quiz Yourself

Topic: Don't Get Crushed by Moving Parts
Duration: 1 Period(s)

Topic Description (short)
This lesson will teach you to identify the parts of the machine that can crush you.

Learning Targets
1. Recognize how moving parts can crush you.
2. Identify safe work practices that protect you from being crushed.

Formative Assessment
Lesson 3 Quiz Yourself.

Topic: Prevent Rollover Accidents
Duration: 1 Period(s)

Topic Description (short)
How to prevent the skid steer from rolling over.

Learning Targets
1. Identify safe work procedures to avoid rollover accidents.
Describe what could happen when safety procedures are not followed.

Formative Assessment
Lesson 4 Quiz Yourself.

Topic: Other Operational Hazards
Duration: 1 Period(s)

Topic Description (short)
Identify other dangers including running over bystanders, running into obstacles, traffic accidents, electrocution, and poisoning.

Learning Targets
1. Describe how to avoid collisions with obstacles, traffic and people.
2. Identify dangers from electricity, carbon monoxide, fuels and other fluids as well as falling materials.

Formative Assessment
Lesson 5 Quiz Yourself.

Topic: Environmental Hazards
Duration: 1 Period(s)

Topic Description (short)
Identify proper working conditions in order to stay safe.

Learning Targets
1. Identify environmental hazards.
2. Recognize treatment and first aid for exposure to environmental hazards.

Formative Assessment
Lesson 6 Quiz Yourself.

Topic: Safe Operation
Duration: 1 Period(s)

Topic Description (short)
Students will navigate a skidsteer through an obstacle course designed by an industry professional.

Learning Targets
1. Engage the implement safely
2. Operate the machine safely.

Formative Assessment
Participation Grade.

Unit: Concrete

Duration: 10 Period(s)

Unit Description
Students will demonstrate the ability to safety calculate and pour the appropriate amount of concrete for a given job.

Enduring Understandings (Knowledge & Skills)
Students will demonstrate the ability to safety calculate and pour the appropriate amount of concrete for a given job.

Academic Vocabulary
Concrete
Cement
Aggregate
Cubic Yards
Rebar
Tension Strength
Compression Strength

Summative Assessment
Students will complete a practical and theoretical exam.

Topic: The Science of Concrete

Duration: 1 Period(s)

Topic Description (short)
Students will discover the science behind how concrete works.

Learning Targets
Students will watch the MegaStructures video and answer the questions from Assignment Sheet

Formative Assessment
Assignment Sheet 1

Topic: Safety in Working with Concrete

Duration: 1 Period(s)

Topic Description (short)
Discuss safety in working with concrete.

Learning Targets
What is concrete?
How can concrete be dangerous to people?
What is the proper personal protective clothing to use when working with concrete?

Formative Assessment
Lesson evaluation and concrete safety activity.

Topic: Site Preparation

Duration: 1 Period(s)

Topic Description (short)
Identify site preparation requirements.

Learning Targets
What are factors in preparing a subgrade?
What are footings, and why are they needed?
How is the foundation of an agricultural structure laid out?
What are factors in preparing the final grade?

Formative Assessment
Assignment sheet having students lay out the corner stakes for an 8' x 10' building.

Topic: Concrete Tools

Duration: 2 Period(s)

Topic Description (short)

Students will identify common tools used in concrete construction.

Learning Targets
Develop a Google Slideshow of the 30 most common tools used in concrete construction.

Formative Assessment
Identification Quiz.

Topic: Pouring a Concrete Slab **Duration:** 1 Period(s)

Topic Description (short)
Describe the procedure for preparing to pour a concrete slab.

Learning Targets
1. What tools are needed for pouring concrete?
2. What are forms for concrete pouring?
3. How are forms constructed for slabs?
4. What is the purpose of reinforcement in concrete?
5. What are the types of reinforcement for concrete?
6. How should reinforcement be installed?
7. What are expansion and control joints, and when are they needed?

Formative Assessment
Evaluation Sheet

Topic: Pouring Concrete Walls **Duration:** 1 Period(s)

Topic Description (short)
Describe the procedure for pouring a concrete wall.

Learning Targets
1. What tools are needed for pouring walls?
2. What are the form types available for walls?
3. How are forms constructed for walls?
4. How should reinforcement be installed in walls?
5. What are the procedures for pouring a wall?
6. What are methods of preventing water from entering a structure?

Formative Assessment
Evaluation Sheet.

Topic: Calculating the volume of Ingredients used for Concrete **Duration:** 1 Period(s)

Topic Description (short)
Calculate the volume of ingredients required for a specific concrete job.

Learning Targets
Perform the necessary calculations to figure out the volume of the raw materials needed for the concrete slab described in the problem.

Formative Assessment
Assignment sheet 5

Topic: Ordering Concrete **Duration:** 2 Period(s)

Topic Description (short)
Explain the procedure for ordering concrete.

Learning Targets
How is the necessary quantity of concrete caluclated?

Formative Assessment
Assignment sheet 6

Unit: Framing **Duration:** 23 Day(s)

Unit Description
Students learn the processes for framing floors, walls, ceilings, and roofs.

Enduring Understandings (Knowledge & Skills)
Students will understand how wood is used to construct a house.

Academic Vocabulary

- balloon framing
- band joist
- blocking
- briding
- catilevered
- chord
- cross bridging
- crown
- deflection
- girder
- hanger
- header
- herringbone bridging
- I-joist
- joist
- ledger
- mudsill
- platform framing
- post anchor
- post-and-beam framing
- ribbon
- rough flooring
- sill
- sill plate
- sill sealer
- solid bridging
- span
- steel post
- stirrup
- subflooring
- tail joist
- trimmer
- underpinning
- web
- wide flange
- advanced framing
- ceiling frame
- ceiling joist
- cripple stud
- header
- housewrap
- jack stud
- metal strap bracing
- nailer
- partition
- rough opening
- sheathing
- soffit
- sole plate
- story pole
- strongback
- structural insulated panel (SIP)
- stud
- top plate
- trimmer stud
- bird's mouth
- camber
- collar tie
- common difference
- common rafter
- cornice
- cripple jack
- dead load
- dormer
- extended rake
- fascia
- Fink truss

- flat roof
- framing square
- gable roof
- bambrel roof
- gusset
- hip jack
- hip jack rafter
- hip rafters
- hip roof
- hypotenuse
- king post truss
- live load
- lookout
- mansard roof
- pitch
- purlin
- rafter
- ridge
- rise
- roof truss
- run
- scissors truss
- sheathing
- shed roof
- skip sheathing
- slope
- speed square
- truss
- valley jack
- valley rafter
- W truss

Summative Assessment
Practical and Theoretical Exam.

Topic: Construction Safety **Duration:** 1 Period(s)

Topic Description (short)
Describe safety practices associated with building construction

Learning Targets
1. What are safety factors to consider when working with heights?
2. What are safety factors to consider when working with construction equipment and tools?
3. What are safety factors to consider when working with structural elements?

Formative Assessment
Lesson 1 Activity Sheet and Evaluation

Topic: Building Designs **Duration:** 1 Period(s)

Topic Description (short)
Identify types and designs of building and their methods of construction.

Learning Targets
1. What are different designs and uses of agricultural structures?
2. What are advantages and disadvantages of different types of structures?
3. What factors should be considered when designing and constructing agricultural structures?

Formative Assessment
Lesson 2 Evaluation and Activity Sheet.

Topic: Building Materials **Duration:** 2 Period(s)

Topic Description (short)
Identify and select building materials used in framing.

Learning Targets
1. What are the different types of building materials?
2. What are the types and grades of dimensional lumber?
3. What are the types and grades of sheathing materials?

Formative Assessment
Lesson 3 Evaluation and Activity Sheet

Topic: Fasteners and Fastening Systems
Duration: 2 Period(s)

Topic Description (short)
Identify the uses of different fasteners and fastening systems.

Learning Targets
1. What are the groups of fasteners and uses of each group?
2. What are the factors to consider when selecting nails?
3. What are the types of screws and their uses in agricultural structures?
4. What are adhesives and their uses?
5. What are the types of construction anchors and their uses?
6. What are the types of framing anchors and their uses?

Formative Assessment
Lesson 4 Evaluation and Activity Sheet.

Topic: Floors and Subfloors
Duration: 5 Period(s)

Topic Description (short)
Describe how to construct a floor and subfloor.

Learning Targets
1. Explain the difference between platform, balloon, and post-and-beam framing.
2. Identify the main parts of a platform frame.
3. Calculate the load on girders and beams used in residential construction.
4. Lay out and install sills on a foundation wall.
5. Describe how layouts are made on a header joist.
6. Explain the correct procedure to follow when correcting problems with floor frames.
7. Identify the parts of a floor truss.
8. Describe materials used for subflooring.
9. Estimate materials (sizes and amounts) required to construct a specific floor frame.

Formative Assessment
Chapter Review Questions, Estimation Activity, and Subfloor Construction Activity.

Topic: Walls and Ceilings
Duration: 5 Period(s)

Topic Description (short)
Describe the purposes of walls and ceilings, types of walls, supports, and siding of agricultural buildings.

Learning Targets
1. Identify the main parts of a wall frame.
2. Explain methods of forming the outside corners and partition intersections of wall frames.
3. Show how rough openings are handled in wall construction.
4. Calculate header sizes.
5. Explain plate and stud layout.
6. Describe the construction and erection of wall sections and partitions.
7. List the materials commonly used for sheathing.
8. Demonstrate the process of ceiling frame construction.
9. Explain the benefits of using advanced framing.
10. Explain what SIPs are and how they are erected.
11. Estimate materials required for wall frames, ceiling frames, sheathing, studs, and headers.

Formative Assessment
Chapter Review Questions, Estimating Activity, and Wall Construction Activity.

Topic: Roof Framing
Duration: 5 Period(s)

Topic Description (short)
Select a Roof Support System.

Learning Targets
1. What is the difference between a truss and a rafter?
2. How is a roof system selected?
3. What is pitch?
4. How is the pitch of a roof figured?
5. What are the parts of a rafter?

6. How is a rafter laid out?
7. What is a top plate?
8. How is a top plate constructed?
9. How is a truss ordered?
10. What are the types of roof styles?

Formative Assessment
Chapter Review Questions, Rafter layout activity.

Topic: Roofing Materials **Duration:** 2 Period(s)

Topic Description (short)
Select roofing materials.

Learning Targets
1. What different types of roofing materials are available?
2. What are the advantages and disadvantages of different types of roofing materials?
3. What are the structural components of a roof?
4. How are different types of roofs attached?
5. Estimate the cost of a new roof.

Formative Assessment
Evaluation and Activity Sheet.

Unit: Electricity **Duration:** 32 Period(s)

Unit Description
Students will be able to run basic circuits from the service electrical panel.

Enduring Understandings (Knowledge & Skills)
Upon completion of the unit students will be able to safely wire basic circuits in their home.

Academic Vocabulary
Unit vocabulary can be found here:

file:///G:/My%20Drive/01%20-%20Courses/02%20-%20Ag%20Structures/05%20Electricity/Electricity%20Unit/13%20-%20Electrical%20Terms/Standard%20Electrical%20Terms.pdf

5 Key terms include:

Circuit
Voltage
Amperage
Resistance
Wattage

Summative Assessment
Students will complete the practical and theoretical portion of the unit exam.

Topic: Safety in Working with Electricity **Duration:** 1 Period(s)

Topic Description (short)
Identify the dangers and safety practices associated with electrical work.

Learning Targets
1. What are the basic rules of electrical safety?
2. What are the sources of electrical defects in equipment?
3. What should be done if someone gets shocked?
4. What are the types of circuit protection?

Formative Assessment
Safety test, AS 1.1 for Unit 5 lesson 1

Topic: Electrical Terminology **Duration:** 2 Period(s)

Topic Description (short)
Identify the terms associated with electrical work.

Learning Targets
1. What are the terms and definitions of electricity?
2. What is the NEC?

3. How are NEC guidelines enforced?
4. What does a UL listing mean?

Formative Assessment
Lesson Evaluation and Activity

Topic: Wire Types and Uses
Duration: 3 Period(s)

Topic Description (short)
Match types and sizes of wire with their uses.

Learning Targets
1. What are the different types of wire?
2. Which wires are best adapted for agricultural wiring?
3. Why is wire size important?
4. How is the right wire size selected?
5. What are feeder wires?
6. How does demand load affect the feeder wire?
7. How does length and voltage drop affect feeder wire size?
8. What are some rules of thumb to apply when calculating the circuit needs of a structure?
9. What is the procedure for calculating the load in an agricultural building?

Formative Assessment
Evaluation and Feeder Wire Size Calculation.

Topic: Grounding and GFCI Protection
Duration: 1 Period(s)

Topic Description (short)
Identify the importance of grounding and GFCI protection.

Learning Targets
1. What is grounding and why is it important?
2. What are the NEC requirements for grounding?
3. What are GFCIs?
4. what are the NEC requirements for GFCI use?
5. What are the types of GFCI units used in agriculture structures?

Formative Assessment
Lesson Evaluation and Activity

Topic: Lights, Outlets, Switches, and circuit Protection
Duration: 2 Period(s)

Topic Description (short)
Locate lights, outlets, and switches, and identify circuit protection needs.

Learning Targets
1. What are the rules for lighting outlets located in an agriculture structure?
2. What are the types of lighting and their uses?
3. What are the rules for convenience outlets located in an agriculture structure?
4. What are the rules for switches located in an agriculture structure?
5. What electrical protection is needed in an agricultural structure?
6. What are the general recommendations for branch circuits?

Topic: Electrical Symbols in Wiring Plans
Duration: 1 Period(s)

Topic Description (short)
Identify the symbols used in agricultural wiring plans.

Learning Targets
1. Which symbols are used to indicate lighting, receptacle, and switch outlets?
2. Which symbols are used to indicate power, fusing, and grounding?
3. Which symbols are used to indicate panelboards, switchboards, and related equipment?
4. Which symbols are used to indicate remote control stations for motors or other equipment?
5. Which symbols are used to indicate miscellaneous connections?

Formative Assessment
Lesson Evaluation and Activity.

Topic: Running Electrical Wiring
Duration: 1 Period(s)

Topic Description (short)
Identify the methods by which electricity enters and agricultural structure.

Learning Targets
1. What is the configuration at the pole?
2. How is the service entrance installed?
3. When would branch circuits be used on agricultural structures?
4. What must be considered when wiring a barn?
5. What must be considered when wiring a hay barn?
6. How are switches and receptacles selected?

Formative Assessment
Lesson Evaluation and Activity.

Topic: Connecting to the SEP
Duration: 2 Period(s)

Topic Description (short)
Identify procedures for connecting the drop wires and branch circuit wires to the SEP.

Learning Targets
1. What are the parts of the SEP?
2. What are some good wiring practices to follow when wiring the panel?
3. What is the procedure for connecting the service entrance conductors to the SEP?
4. How is the ground system installed for the SEP?
5. How are circuit protectors selected and sized?
6. How are the 120-volt branch circuits connected to the SEP?
7. How are the 240-volt individual circuits connected to the SEP?
8. What is three-phase power, and when should its use be considered?

Formative Assessment
Lesson Evaluation and Activity

Topic: Running Wire from the SEP
Duration: 15 Period(s)

Topic Description (short)
Describe how to run wiring from the SEP to a junction box, lights, and receptacles.

Learning Targets
1. Where should the service entrance panel be located?
2. How is the route of each circuit determined?
3. How are the wires run through the building?
4. What tools are needed to wire a receptacle or light?
5. What is the function of a junction box?
6. what techniques are used when splicing wires?
7. How is a light circuit wired?
8. How are convenience outlet circuits wired?
9. How is a switch loop wired?
10. How are two outlets wired in the same box?
11. How are two outlets wired in separate boxes?
12. How are two lights controlled by one switch wired?
13. How are lights controlled from two locations wired?
14. How is a "California 3-way" wired?
15. How is a "Dead-end 3-way" wired?
16. How do you control lights from 3 or more locations?

Formative Assessment
Practical Evaluation

Topic: Cost and Electrical Power Use
Duration: 4 Period(s)

Topic Description (short)
Calculate cost and electrical power using Ohm's Law.

Learning Targets
1. What is the power equation, Ohm's Law, and their applications?
2. How is electricity measured?
3. How is the cost of electricity determined for each plan?

Formative Assessment
Lesson Evaluation and Activity

Agricultural Mechanics

Agriculture

Grade(s) 10th - 12th, Duration 1 Year, 1 Credit
Elective Course

Unit: Plumbing

Duration: 12 Period(s)

Unit Description

Students will learn the basics of water distribution in agricultural systems.

Enduring Understandings (Knowledge & Skills)

Students should be able to safely construct basic plumbing systems using various plumbing equipment and materials.

Academic Vocabulary

- bored well
  casing
- compression fitting
- compression valve
- drainage, waste, and venting (DWV) system
- drilled well
- faucet
- fixture
- flare fitting
- gate valve
- O-ring
- PEX (cross-linked polyethylene)
- pipe compound
- plumber's putty
- potable
- rough-in
- slip-joint washer
- stub-in
- submersible pump
- sweat soldering
- Teflon tape
- vent stack
- venting
- water supply system

Summative Assessment

Theoretical and Practical Exam

Topic: Water Needs

Duration: 1 Period(s)

Topic Description (short)

Calculate how much water is needed for a farmstead.

Learning Targets

1. What are the sources of water on a farmstead?
2. What are the uses of water on a farmstead?
3. How is the total daily water need determined?
4. How is peak water need determined?

Formative Assessment

Lesson Evaluation and Activity

Topic: Plumbing Safety

Duration: 1 Period(s)

Topic Description (short)

Discuss safety practices for plumbing.

Learning Targets

1. What are the different hazards associated with plumbing?
2. What are the tools needed for safe plumbing practices?
3. What are the proper methods for using tools and supplies associated with plumbing?

Formative Assessment

Lesson Evaluation and Activity

Topic: Pipe types and Size Requirements

Duration: 4 Day(s)

Topic Description (short)

Identify pipe types and determine size requirements.

Learning Targets

1. What are the types of pipes and characteristics of each?
2. How are pipes sized?
3. How is the pipe size needed to deliver a desired flow rate determined?

Formative Assessment
Lesson Evaluation and Activity

Topic: Measuring, Cutting, and Connecting Pipes **Duration:** 6 Period(s)

Topic Description (short)
Measure, cut, and connect pipes and tubing.

Learning Targets
1. What factors must be considered before proper measurement of a pipe system can be accomplished?
2. How are different types of pipe cut properly?
3. What methods are available to join different types of pipe?
4. Cut and join PVC pipe.
5. Join a copper pipe and fitting.
6. Splice together PEX tubing and fittings.

Formative Assessment
Lesson Evaluation and Activities

Unit: Fencing **Duration:** 10 Day(s)

Topic: Fencing Basics **Duration:** 1 Period(s)

Topic Description (short)
Discuss the terminology, dangers, and safety practices associated with building fences.

Learning Targets
1. What is a legal fence?
2. What are the common tools used in building fences and safety measures for their uses?
3. What are the safety measured used in putting up a fence?

Formative Assessment
Lesson Evaluation

Topic: Setting and Bracing Posts **Duration:** 2 Period(s)

Topic Description (short)
Describe how to set and brace wood and steel posts.

Learning Targets
1. What are the materials and tools needed for installing wood posts and braces?
2. Where are wood and steel anchor-and-brace assemblies located?
3. How are assemblies and brace wire installed?
4. How are the wood line posts installed?
5. What tools are needed for installing steel posts and braces?
6. How are steel post-and-brace assemblies installed?
7. How are steel line posts installed?
8. What are the factors to consider when installing a gate?

Formative Assessment
Lesson Evaluation and Activity

Topic: Barbed and Woven Wire Fences **Duration:** 3 Period(s)

Topic Description (short)
Describe techniques for building barbed and woven wire fences.

Learning Targets
1. What materials and tools are needed to install barbed wire fencing?
2. How is barbed wire laid out on the fence line?
3. How is barbed wire stretched?
4. How is barbed wire attached?
5. What materials and tools are needed for woven wire?
6. How is woven wire laid out?
7. How is woven wire stretched?

8. How is woven wire attached?

Formative Assessment
Lesson Evaluation and Activity

Topic: High Tensile and Electric Fences **Duration:** 3 Period(s)

Topic Description (short)
Describe techniques for building high tensile and electric fences.

Learning Targets
1. What are the advantages of high tensile fencing?
2. What are the components of high tensile fencing?
3. How are high tensile fences constructed?
4. What are the advantages of electric fences?
5. What are the components of electric fences?
6. How should electric fence chargers be selected?
7. How are electric fences constructed?

Formative Assessment
Lesson Activity and Evaluation

Topic: Fence Mending Techniques **Duration:** 1 Period(s)

Topic Description (short)
Identify fence mending techniques.

Learning Targets
1. What are the methods of tightening fence wires?
2. What are the tools available for mending broken wires?
3. What are the different methods of splicing?
4. How are posts replaced in an existing fence line?

Formative Assessment
Lesson Evaluation

Unit: Small Gas Engines **Duration:** 50 Period(s)

Unit Description
A unit designed to develop skills in selection, operation, and maintenance of small air-cooled engines

Enduring Understandings (Knowledge & Skills)
Students should understand the basic principles concerning the operation of single cylinder 4-stroke engines.

Academic Vocabulary
see attached

https://drive.google.com/drive/folders/17bwT7e8UuxOwG2-s4oJjw1HXs4GRFIBJ

Summative Assessment
Theoretical and Practical Exam

Topic: Safety **Duration:** Ongoing

Topic Description (short)
Safety in the Small Gas Engine Shop

Learning Targets
1. Identify safety equipment necessary for agricultural power technology
2. Apply basic laboratory safety instruction
3. Describe safety practices when using electrical equipment
4. Apply safety practices when using tools and equipment.

Formative Assessment
Safety Quiz

Topic: Introduction to Engines **Duration:** 4 Period(s)

Topic Description (short)
Explain the general operation theories of 2 stroke and 3 stroke engines

Learning Targets
1. Identify basic terms and definitions associated with small engines
2. List tools required to work on small engines
3. Compare and contrast the advantages and disadvantages of 2 stroke and 4 stroke engines
4. Describe the differences in operation between 2 stroke and 4 stroke engines
5. Identify the functions of each engine stroke
6. Calculate and compare engine displacement
7. Identify the required elements to make an engine run
8. Describe each element required to make an engine run.

Formative Assessment
Quiz and Lesson Exam

Topic: Operational Theory of Compression
Duration: 2 Period(s)

Topic Description (short)
Explain the principles and theories of compression as it is related to small combustion engines.

Learning Targets
1. Identify basic terms and definitions associated with compression
2. List individual engine parts related to compression
3. Describe, compare, and contrast compression ratios
4. Calculate engine displacement
5. Test engine compression

Formative Assessment
Quiz and Activity

Topic: Parts and Tool Identification
Duration: Ongoing

Topic Description (short)
It is important for students to know the correct names of parts and tools so they can communicate effectively when ordering new parts. Students will identify engine parts and tools and describe the function of each part or tool.

Learning Targets
1. Identify the basic components of a small engine and describe the function of each component.
2. Describe engine block variations.
3. Describe the construction and operation of the crankshaft.
4. Explain piston design considerations and differentiation between types of piston rings.
5. Describe connecting rod and bearing variations.
6. Identify common valve train configuration.

Formative Assessment
Lesson Quiz

Topic: Initial Engine Assessments
Duration: 4 Period(s)

Topic Description (short)
Students will be able to perform simple tests and observations to determine if it will be economically feasible to overhaul an engine.

Learning Targets
1. Identify engine parts that are known to wear given certain conditions.
2. Associate engine conditions with cause worn parts or improper operation.

Formative Assessment
Quiz and Checklist to Determine Engine Repair Activity

Topic: Disassemble to Valves (External Parts)
Duration: 4 Period(s)

Topic Description (short)
Students will be able to disassemble the internal parts of an engine.

Learning Targets
1. Explain 3 types of air cleaners
2. Demonstrate how governors work
3. Demonstrate how blade brake works with kill wire
4. Demonstrate how vertical pull starter works
5. Explain function of breather
6. Demonstrate engine disassembly
7. Demonstrate parts washer

Formative Assessment
Lab Activities

Topic: Engine Disassembly (Internal Parts)
Duration: 6 Period(s)

Topic Description (short)
Students will be able to disassemble the internal parts of an engine.

Learning Targets
1. Remove breaker point cover, points, and condenser if equipped
2. Remove sump cover
3. Remove governor gear and arm (mechanical governor
4. Remove cam gear
5. Remove piston and rod
6. Remove crankshaft
7. Remove rings
8. Remove oil seals
9. Scrape off old gaskets
10. Clean valves and top of piston w/wire wheel
11. Remove oil plugs
12. Clean all parts with solvent
13. Record and broken bolts, parts, stripped threads, missing parts, or bolts
14. Clean engine parts with parts washer

Formative Assessment
Lab Activities

Topic: Engine Measuring
Duration: 10 Period(s)

Topic Description (short)
Students will be able to perform engine measurements necessary to identify engine wear.

Learning Targets
1. Identify the parts of a micrometer
2. Identify and properly use gauges used to measure engine parts
3. Read a micrometer
4. Measure engine parts within 0.0005"
5. Understand and use decimals to describe engine wear
6. Understand and use U.S. customary measurements
7. Perform addition of decimals to obtain precise measurements
8. Judge reasonableness of measurements
9. Communicate measurement results using appropriate terminology and methods.

Formative Assessment
Lesson Quiz

Topic: Theory of Operation Ignition System
Duration: 2 Period(s)

Topic Description (short)
Students will be able to explain the general theories and principles of magneto ignition systems.

Learning Targets
1. Identify basic terms and definitions associated with magneto ignition systems
2. test and diagnose ignition problems
3. List and identify the parts related to a magneto ignition systeem
4. Describe the principles of magneto ignition systems
5. Identify the functions of individual parts related to ignition systems.

Formative Assessment
Lesson Quiz and Lab Activity

Topic: Operational Theory of Carburetion
Duration: 2 Period(s)

Topic Description (short)
Students will be able to explain principles and theories of carburetion in small engines.

Learning Targets
1. Identify basic terms and definitions associated with carburetion
2. List and identify individual engine parts related to carburetion
3. Describe the operation of 3 different types of carburetors (Flo-Jet, Pulsa-Jet, and Vacu-Jet)

4. Describe the function(s) of individual carburetor parts
5. Adjust carburetors to proper air/fuel mixtures and speeds
6. Understand diaphragm pumps
7. Understand concepts of motion and forces such as Bernoulli's principle, gravity, Venturi, and air foil

Formative Assessment
Lesson Quiz

Topic: Carburetor disassembly and re-assembly **Duration:** 10 Period(s)

Topic Description (short)
Students will be able to disassemble, clean, repair, and reassemble a carburetor.

Learning Targets
1. Disassemble carburetor
2. Order carburetor parts
3. Flatten carburetors
4. Clean carburetor
5. Wrap clean carburetor parts in a clean rag and store
6. Memorize model number of their engine
7. Re-assemble carburetor when parts arrive.

Formative Assessment
Lab Activity

Topic: Parts Ordering **Duration:** 4 Period(s)

Topic Description (short)
Students will be able to obtain part numbers and order engine parts.

Learning Targets
1. Identify engine parts from an exploded view
2. Associate reference numbers with part numbers and prices
3. Communicate technical information

Formative Assessment
Lab Activity

Topic: Major Engine Failure Analysis **Duration:** 2 Period(s)

Topic Description (short)
Students will be able to associate causes with effects of major engine failure.

Learning Targets
1. Identify engine parts that are obviously worn
2. Associate worn parts with the cause of wear
3. Understand constancy, change, and measurement

Formative Assessment
Lesson Quiz

Topic: Rewind Starters **Duration:** 2 Period(s)

Topic Description (short)
Students will be able to disassemble, clean, repair and reassemble rewind starters

Learning Targets
1. Identify the parts of a rewind starter
2. Properly use tools for assembling rewind starters
3. Listen for information
4. Read for technical information

Formative Assessment
Completion of student engines

Topic: Machine Work **Duration:** 11 Period(s)

Topic Description (short)
Students will be able to perform machine work necessary to bring worn engine parts back to factory specifications.

Learning Targets

1. Install point plunger bushing or plug
2. Install new valve guide bushings
3. Replace valve seats
4. Replace main bearings
5. Grind valve faces
6. Cut valve seats
7. Resize cylinder or break glaze
8. Listen for information
9. Read for technical information.

Formative Assessment
Completion of student engines.

Topic: Re-Assembly
Duration: 12 Period(s)

Topic Description (short)
Students will be able to assemble an engine.

Learning Targets
1. Clean engine again
2. Install rings on piston
3. Assemble block, crankshaft, & sump cover to check cranshaft end play
4. disassemble block, crankshaft, & sump after checking end play
5. Install piston in cylinder
6. Install crankshaft
7. Install rod cap
8. Assemble tappets and cam gear
9. Have teacher check assembly and install sump cover
10. Re-check crankshaft end play
11. Grind valves for tappet clearance
12. Install valves and springs
13. Assemble head & shield
14. Install breather
15. Install armature
16. Install flywheel
17. Install flywheel screen
18. Adjust armature gap
19. Install muffler
20. Install cylinder shield
21. clean gas tank
22. Assemble carburetor
23. Install carburetor
24. Adjust governor
25. Check spark

Formative Assessment
Assembly of student engines.

Topic: Starting Engines
Duration: 1 Period(s)

Topic Description (short)
Student engines will be started and all work should be complete.

Learning Targets
1. Convert between quarts, fluid ounces, and liters
2. Start engines
3. Read a vibration tachometer
4. Adjust carburetors to specifications
5. Recognize if an engine is running too rich or too lean.

Formative Assessment
Engine Runs.