

KANE AREA SCHOOL DISTRICT



Vocational Agricultural Courses 2023

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Carpentry

Statement of Organization:

This course is designed to introduce students to the proper use, care as well as safety and maintenance of hand and power tools for carpentry as it pertains to the agricultural industry. Design, layout, and construction skills are initiated through the use of small group projects and concluded by constructing a storage facility to scale as a class project.

Expected Levels of Achievement:

All students will be expected to achieve mastery of the skills and concepts taught by obtaining a minimum of eighty percent (80%) on all graded materials and projects.

Methods of Evaluation:

Student competence will be assessed through the use of one or more of the following methods:

- Performance tests
- Observation
- Guided practice
- Individual Projects
- Group Projects
- Teacher-made quizzes
- Teacher-made tests

Time:

Carpentry is a two-credit elective that meets for a minimum of two hundred forty (240) clock hours and is available to students in grades eleven and twelve.

Technology Integration:

In addition to print resources, on-line resources will be used to supplement instruction for tools/materials that are not readily available, as well as for new products and technologies developed in the future.

Big Idea	Concepts	Competencies	Standard
EMPLOYMENT	Carpentry careers	- Review trades related to the carpentry field - Explore career options and relate them to individual interests and aptitudes - Understand the importance of agricultural mechanics skills necessary to succeed in the building trades	CC3.5.11-12.J 13.1.11A 13.1.11.B 13.1.11.D 13.1.11.F
SAFETY	Shop safety	Identify and follow shop safety procedures that align with the agricultural industry standards.	CC.3.6.11-12.B CC.3.5.11-12.A CC.3.5.11-12.G CC3.5.11-12.J
	Hand tool Safety	Demonstrate safe and proper use of hand tools.	CC3.5.11-12-12.C CC3.6.11-12.B CC3.5.11-12.G
	Portable power tool safety	- Demonstrate safe and proper use of portable power tools - Maintenance of equipment	CC3.5.11-12-12.C CC3.6.11-12.B CC3.5.11-12.G.
	Stationary power equipment safety	- Demonstrate safe and proper use of stationary power equipment - Maintenance of equipment	CC3.6.11-12.B CC3.5.11-12-12.C CC3.5.11-12.G
BUILDING MATERIALS	Lumber measurement	Calculate and define board feet, square feet, and lineal feet	2.3.HS.A.12 2.1.HS.F.2 2.1.11.B 2.1.HS.F.4 2.1.HS.F.5
	Characteristics of sheathing materials	Investigate the construction of panel materials such as plywood, OSB, particleboard, and hardboard	3.5.11-12.D 3.6.11-12.B 1.3.11-12.I
	Characteristics of pressure treated lumber	List the advantages and uses of pressure treated lumber	3.5.11-12.J 1.3.11-12.I 3.6.11-12.B

Big Idea	Concepts	Competencies	Standard
	Hardware specifications	Identify and list specifications of framing nails and deck screws	3.5.11-12.G 3.6.11-12.B 1.3.11-12.I 3.5.11-12.J
ARCHITECTURAL DRAWINGS	Blueprint reading	Locating information and specifications on construction plans	3.5.11-12.D 2.3.HS.A.13 2.3.HS.A.14 3.5.11-12.A.
	Drawing scale	Use a $\frac{1}{4}"=1'$ scale to determine overall dimensions and size of rooms in a one-story house	2.1.HS.F.2 2.1.HS.F.4 3.5.11-12.D 2.1.HS.F.5 2.3.HS.A.14
FLOOR CONSTRUCTION	Floor layout	- Utilize the Pythagorean theorem to layout and square agricultural structures. - Layout and construct floor systems 16" O.C.	3.5.11-12.G 2.3.8.A.3 2.1.HS.F.2 3.5.11-12-12.C 2.1.HS.F.4 2.1.HS.F.5 CC.2.1.HS.F.4
	Framing a floor	- Layout and install sill plates - Layout and install rim joists - Layout and install floor joists - Layout and install cross bridging	2.1.HS.F.2 2.1.HS.F.4 3.5.11-12-12.C CC.2.1.HS.F.4 2.1.HS.F.5 3.4.10.E.7
	Framing floor openings	Layout and frame floor openings	2.3.HS.A.14 2.1.HS.F.2 2.1.HS.F.4 2.1.HS.F.5 3.5.11-12-12.C CC.2.1.HS.F.4

Big Idea	Concepts	Competencies	Standard
	Constructing floor deck	Layout and nail/screw sub flooring	CC.2.1.HS.F.4 3.5.11-1212.C 2.1.HS.F.2 2.1.HS.F.4 2.1.HS.F.5
WALL CONSTRUCTION	Framing walls	- Layout and construct walls 16” OC - Layout and construct walls 24” OC	2.1.HS.F.2 3.5.11-1212.C CC.2.1.HS.F.4 2.1.HS.F.4 3.4.10.E.7 2.1.HS.F.5
	Window and door rough openings	- Layout and construct door openings - Layout and construct window openings - Layout and construct trimmer and cripple studs - Layout and construct solid door and window headers	2.1.HS.F.2 2.1.HS.F.4 3.5.11-1212.C 2.1.HS.F.5 CC.2.1.HS.F.4
	Plumbing and bracing in walls	Properly plumb, align, and brace walls	3.5.11-1212.C CC.2.1.HS.F.4
	Insulation R value	Define and understand insulation R value	3.5.11-12.J 1.3.11–12.I 3.5.11-12.A 3.5.11-12.B 3.5.11-12.D
	Insulation types	- List advantages of different insulation types (Cellulose/ fiberglass/ spray foam, etc.) - Explain the installation of different insulation types	3.5.11-12.D 1.3.11–12.I 3.5.11-12.A. 3.5.11-12.B 3.5.11-12.J
ROOF CONSTRUCTION	Pre-engineered truss rafters	Identify different types of truss rafters	1.3.11–12.I 3.5.11-12.J

Big Idea	Concepts	Competencies	Standard
	Framing a gable roof	- Layout, cut, and install a ridge board for agricultural storage facility - Layout, cut and install common rafters for agricultural storage facility - Layout, cut, and install collar ties for agricultural storage facility	CC.2.1.HS.F.4 3.4.10.E.7 2.1.HS.F.2 2.3.8.A.3 2.1.HS.F.4 3.5.11-1212.C 2.1.HS.F.5 2.3.HS.A.14
	Asphalt roofing materials	- Layout and install roof sheathing - Layout and install roofing paper - Layout and install asphalt shingles - Layout and install cap shingles	2.1.HS.F.2 2.1.HS.F.4 CC.2.1.HS.F.4 2.1.HS.F.5 3.5.11-1212.C
	Metal Roofing materials	- Identify advantages and disadvantages of metal roofing products for agricultural structure - Calculate cost of roofing materials per square foot	2.1.HS.F.2 2.1.HS.F.4 CC.2.1.HS.F.4 2.1.HS.F.5
STAIRWAY CONSTRUCTION	Designing Utility Stairs	Calculate the number of stair treads and risers needed to reach an assigned finished floor height	2.1.HS.F.2 CC.2.1.HS.F.4 3.5.11-12.G. 3.4.10.E.7 2.1.HS.F.4 2.1.HS.F.5
	Framing utility stairs	- Layout, cut, and install stair stringers - Cut, and install stair treads and risers - Layout and install a stair handrail	3.5.11-1212.C 2.1.HS.F.2 2.3.8.A.3 2.1.HS.F.4 CC.2.1.HS. 2.1.HS.F.5F.4
EXTERIOR FINISH	Manufactured windows	Install exterior windows for agricultural storage facility	3.5.11-1212.C CC.2.1.HS.F.4
	Pre-hung doors	Install doors	CC.2.1.HS.F.4 3.5.11-1212.C

Big Idea	Concepts	Competencies	Standard
	Horizontal siding	Layout and install siding	3.5.11-1212.C CC.2.1.HS.F.4
	Soffit and fascia materials	Layout and install soffit and fascia	CC.2.1.HS.F.4 3.5.11-1212.C
COST ESTIMATING	Bill of materials	- Estimate the amount of materials with cost needed to frame and finish an exterior wall - Estimate the amount of materials with cost needed to frame and finish an interior wall - Estimate the amount of materials with cost needed to frame and deck a floor - Estimate the amount of materials with cost needed to frame and deck a gable roof - Estimate the amount of materials with cost needed to frame and deck a gambrel roof - Estimate the amount of materials with cost needed to shingle a roof	2.1.HS.F.2 2.1.HS.F.4 2.1.HS.F.5 CC.2.1.HS.F.4

Conservation

Statement of Organization:

This course is designed to teach students skills regarding heavy equipment use as well as information regarding land management, soil structure, surveying, and identification of trees, Identification of invasive and native plants and insects and wildlife indigenous to Pennsylvania. Students will be introduced to appropriate techniques and procedures for the conservation and management of these natural resources along with outdoor safety and survival techniques.

Expected Levels of Achievement:

All students will be expected to achieve mastery of the skills and concepts taught by obtaining a minimum of eighty percent (80%) on all graded materials and projects

Methods of Evaluation:

Student learning will be assessed through the following methods:

- Teacher-made tests graded with answers keys
- Student engagement and participation
- Skill-based projects graded with rubrics
- Demonstrations

Estimated Instructional Time:

Conservation is a one-credit elective which meets for a minimum of one hundred twenty (120) clock hours and is available for eleventh and twelfth graders.

Technology Integration:

In addition to print resources, students will use technology to create electronic documents for the purpose of presentations and researching wildlife and outdoor survival skills. Students will also be allowed to use their personal electronic devices for the use of a dichotomous key App to identify tree species.

Big Idea (Objectives)	Concepts	Competencies	Standard
HEAVY EQUIPMENT OPERATION	Operating the equipment safely and successfully.	• Demonstrate successful and safe use of tractors • Proper PPEs • Transmission • Front loader operation (forks, bucket) • Backhoe • Drawbar • Demonstrate successful use of log loader • PTO chipper • PTO choker • PTO posthole digger	CC.2.3.HS.A.14 13.1.11.D 2.7.11.E: 2.5.11.A
	Basic maintenance procedures.	• Navigate owner's manual for routine maintenance schedule • Use grease gun to apply grease to grease fittings • Summarize Safe fueling techniques	3.4.10.D2 CC.3.5.9-10.A. CC.11.12.3 13.3.11.G
OCCUPATIONAL ORIENTATION AND SAFETY	Identify daily housekeeping duties.	Perform housekeeping duties daily based on career standards	13.3.11.A 13.3.11.G 3.4.12.A2
	Follow verbal instructions to complete work assignments and rules.	Completing tasks based on student engagement and participation	13.2.11.A 3.4.12.A2 13.3.11.A
	Follow written instructions to complete work assignments and rules.	Completing tasks based on student engagement and participation	13.2.11.A 3.4.12.A2 13.3.11.A
	Understanding proper use and inspection of Personal Protection Equipment (PPE).	Demonstrate on a daily basis	CC.3.5.9-10.A. 13.3.11.A 13.3.11.G
	Identifying work area hazards.	• Demonstrate proper work area operation. • Demonstrate proper use of equipment. • Understand proper work actions for working in confined spaces.	2.5.11. A 13.3.11.A 13.3.11.G 2.7.11.E:
	Display familiarity with industrial and OSHA safety standards.	Understand MSDS sheets and precautionary labeling.	3.4.10.A2 CC.3.5.9-10.A. CC.3.5.11-12.D 13.3.11.A

Big Idea (Objectives)	Concepts	Competencies	Standard
			13.3.11.G
MANAGE NATURAL RESOURCES	Wildlife Management.	- Identify renewable and nonrenewable natural resources - Analyze conservationist vs a preservationist method of management - Assess the role of the Game Commission - Apply the role of individual Pennsylvanians - Analyze the need for proper wildlife management	3.4.10.B1 CC.3.5.9-10B CC.2.1.HS.F.2 13.1.11.D 2.5.11.A
	Define soil erosion and what causes soil erosion.	- Identify soil structure - Predict soil quality - Assess soil samples - Analyzing soil conservation practices - Identify the various types of land uses.	CC.3.5.9-10.A. CC.2.3.HS.A.12 CC.2.1.HS.F.2 13.1.11.D 2.5.11.A
	Mammals of Pennsylvania.	- Understand the historical perspective - Identify types found in PA - Recognizing survival dependencies habitat, food, breeding habits - Hunting and trapping of indigenous mammals {demonstrating knowledge of the laws, understanding proper safety procedures (guns, bows, traps)}	3.4.10.B1 CC.3.5.9-10.A. CC.2.1.HS.F.2 13.1.11.D 2.5.11.A
	Birds of Pennsylvania.	- Understand historical perspective - Identify types found in PA - Recognize survival dependencies habitat, food, breeding habits - Hunting and Trapping of indigenous mammals {demonstrating knowledge of the laws, understanding proper safety procedures (guns, bows, traps)}	3.4.10.B1 CC.3.5.9-10.A. CC.2.1.HS.F.2 13.1.11.D 2.5.11.A
	Tree Identification.	- Identify tree species by leaves - Classify tree species for wildlife influences - Compare tree species as they relate to habitat	CC.3.5.9-10.A. CC.2.3.HS.A.14 13.1.11.D
	Watersheds and wetlands.	Identify roles watersheds and wetlands have to land uses	3.4.12.C3 CC3.5.11-12.1 13.1.11.D
	Surveying.	Apply surveying concepts as they relate to conservation (slope of land for food plots, roads derange ditches land elevation etc.)	3.4.12.C3 3.4.10.B1

Big Idea (Objectives)	Concepts	Competencies	Standard
		- Demonstrate proper instrument set-up - Read elevation rod correctly - Apply mathematics to compute back sights, foresights, benchmarks, and height of instruments - Prepare and maintain a ledger - Locate turning points - Understand soil contours	CC.3.5.9-10B CC.2.1.HS.F.2 CC.2.3.HS.A.14 CC.3.5.H-12.C 13.1.11.D CC.11.12.3
	Utilize private and public land.	- Differentiate between conservation and preservation - Understand laws of private and public land - Utilize public land for the greatest amount of good	3.4.10.B1 CC3.5.11-12.1 2.5.11. A 2.7.11.E:
OUTDOOR SAFETY AND SURVIVAL	Attitudes and responsibilities.	- Demonstrate safety rules and regulations - Critique attitudes to prevent survival situations - List steps taking when found in a survival situation - Layering clothing - Use maps and a compass - Leaving a (FLOAT Plan)	3.4.12.C3 CC.3.5.9-10.A. CC.3.5.9-10B 2.7.11.E: 2.5.11.A
	Primitive living vs. survival.	- Construct short-term survival shelters - Construct long-term primitive living shelters - Identify key components that differentiate survival and primitive living - Finding water and purifying water - Importance of fire and nontraditional ways to build fires	3.4.10.D2 CC.2.3.HS.A.14 CC3.5.11-12.1 2.5.11. A 2.7.11.E: 2.5.11.A
	Outdoor safety	- Using hand tools - Stop - Activity plan - Layering clothing - Signaling for help - Orienteering and map reading clothing	3.4.10.D2 CC.2.3.HS.A.14 CC3.5.11-12.1 2.5.11. A 2.7.11.E: 2.5.11.A
	Basic Water Safety	- Look before you leap - Reach or throw don't go - Survival floats and strokes - Non swimming rescues - PFDs - Basic boating safety evaluate different hazards in different	3.4.10.D2 CC.2.3.HS.A.14 CC3.5.11-12.1 2.5.11. A 2.7.11.E: 2.5.11.A

Big Idea (Objectives)	Concepts	Competencies	Standard
		environments such as heat, cold, open water near shore beachfront moving water pools waterparks • River signals • River terminology and hazards • Rip currents • Surface dives • Help/Huddle • Use clothing as a floatation device	
	Invasive and pest identification and control methods with Native replacements	• Insects • Vegetation • Rodents • Mammals • Trees	

Forestry

Statement of Organization:

This course is designed to provide students with a combination of theory and practical experiences that require extensive involvement in the outdoor laboratory. Students will gain entry-level employment skills as well as career knowledge through instruction in a variety of units related to the forestry industry. Forestry is available to twelfth graders and is course provided for all students in the Vocational graduation track as well as to any other student seeking an elective.

Expected Levels of Achievement:

All students will be expected to achieve mastery of the skills and concepts taught by obtaining a minimum of eighty percent (80%) on all graded materials and projects.

Methods of Evaluation:

Student learning will be assessed through the use of the following methods:

- Teacher-made tests graded with answers keys
- Student engagement and participation
- Skill-based projects graded with rubrics
- Demonstrations
- Projects graded with rubric

Estimated Instructional Time:

Forestry is a two-credit elective, which meets for a minimum of two hundred forty (240) clock hours.

Technology Integration:

In addition to print resources, students will use technology to create electronic documents for the purpose of presentations, researching wildlife, forest regions, and silvicultural practices. Students will also be allowed to use their personal electronic devices for the use of a dichotomous key app to identify tree species and GPS coordinates for collecting data. Student will then use collected data to input into GIS program to maximize usefulness of the collected data.

Big Idea (Objectives)	Concepts	Competencies	Standard
INTRODUCTION TO FORESTRY	Forest regions of the United States.	Distinguish the difference in the six major forest regions of North America • Tropical • Northern • Southern • Western • Central hardwoods • West coast	CC.3.5.9-10B 13.3.11.G 13.1.11.D 2.7.11.E:
	Crown classification according to each tree species.	• Investigate which tree species can live and thrive in emergent, dominant, co-dominant, intermediate, and suppressed states of growth. • Synthesize which individual trees will die off given their placement in the canopy according to each species.	CC.3.5.9-10B 2.7.11.E:
	Classification of trees by size.	• Differentiate seedling, sapling, pole, standard, veteran mature, and over mature trees. • Diameter is a poor indicator of age	CC.2.1.HS.F.5 CC.11.12.3 2.7.11.E:
	Careers related to forestry.	Make observations and use tools for each of the following: Dendrologist, timber marking, harvesting, trucking, heavy equipment operation, site preparation, preservationist, and conservationist. • Genetics and biotechnology. • Wood and paper science or production. • Fish and wildlife management. • Urban forester. • Educator	3.4.10.D3 13.3.11.A 13.1.11.D
TREE SPECIES IDENTIFICATION	Leaf characteristics.	Apply concepts of leaf characteristics to correctly identify tree species by leaves. Differentiate • Margins • Arrangement • Type • Structure	CC.3.5.9-10.A. 2.7.11.E:
	Bark characteristics.	Apply concepts of bark characteristics to correctly identify tree species using bark patterns. Differentiate • Smooth • Lenticels • Peeling strips	CC.3.5.9-10B CC.2.3.HS.A.13 2.7.11.E:

Big Idea (Objectives)	Concepts	Competencies	Standard
		- Vertical cracks - Scales - Uninterrupted ridges - Ridges broken horizontally - Intersecting ridges - Vertical strips - Plates	
	Wood grain.	Apply concepts of wood grain characteristics to correctly identify tree species by wood grain. Differentiate - Color - Grain pattern - Weight - Hardness - Softness - Source - Odor - End grain	CC.3.5.9-10.A. 13.1.11.D 2.7.11.E:
	Dichotomous key for identification.	- Critique an unknown tree species by answering questions about leaves, bark, and woodgrain characteristics to draw conclusions based on a dichotomous key. - Comparing two types of dichotomous keys: paperback and smartphone apps.	3.4.10.A2 CC.11.12.3 2.7.11.E:
ESTIMATING STUMPAGE VOLUMES	Measuring tree DBH.	Analyze the difference in accuracy between dendrometers. - Biltmore sticks - Diameter tape - Tree caliper - Eyeball	CC.2.1.HS.F.5 CC.2.1.HS.F.2 CC.2.3.HS.A.13 13.1.11.D
	Measuring tree height.	Prove tree height using a variety of dendrometers. - Merritt hypsometer - Clinometer Use concepts to solve non- routine problems such as: - Tangent height - Merchantable height	CC.2.1.HS.F.5 2.1.11.B 13.1.11.D
	Calculating board feet and cubic volume of wood products.	Compare log rules and form class. Scribner log rule	CC.2.3.HS.A.12 CC.2.1.HS.F.2

Big Idea (Objectives)	Concepts	Competencies	Standard
		- Doyle log rule - Lots of others Formulate estimates of board foot in standing timber and bucked logs. - Cruising - Scaling	CC.2.3.HS.A.13
	Calculating centrifugal volume used by us forest service.	Investigate the U.S. forest service method of determining board foot in a tree and differentiate their method from the industry standard way.	13.1.11.D 2.7.11.E:
	Weight of wood products.	Hypothesize what the stumpage volume would be according to species.	CC.2.1.HS.F.5 CC.11.12.3
	Plot cruise in a woodlot of known acreage.	- Make observation of basal area using a prism. - Interpret a map using a compass to walk 6 chains between plots.	CC.2.1.HS.F.2 2.1.11.B 13.1.11.D
	100% cruise.	Apply concepts to clinometers, diameter tapes, tree identification and GPSs to collect data for 100% of trees on a given site.	3.4.10.D3 CC.2.1.HS.F.2 2.7.11.E:
	Basal area.	Identify patters of timber stands according to the basal area found using a prism.	CC.3.5.9-10.A. 2.1.11.B 2.7.11.E:
SCALING LOGS TO DETERMINE VOLUMES	Log D.I.B.	Estimate board footage in a log by scaling logs and by taking the diameter inside the bark at the small end and the length of the log.	CC.2.1.HS.F.2 CC.2.3.HS.A.13
	Scaling saw logs.	- Differentiate between species of bucked logs. - Prove terms and concepts used in log scaling. - Graph board foot of log using a log stick, 30' tape, and log rule (Scriber, Doyle, and International) for data collection. - Assess log length with trim allowance.	CC.2.3.HS.A.12 CC.2.3.HS.A.14 CC.2.3.HS.A.13 2.7.11.E:
	Grading saw logs.	- Determine the grade of a log. - Assess log length with trim allowance. - Analyze the log for defects and give the appropriate grade - Stem bulges - Splits - Rot - Insect or bird holes	CC.3.5.9-10.C CC.2.3.HS.A.13 CC.11.12.3 2.7.11.E:

Big Idea (Objectives)	Concepts	Competencies	Standard
		○ Knots ○ Distortion ○ Bumps ○ Shake ○ End defects ○ Double heart ○ stain	
	Calculating saw log volume.	Perform mathematical calculations • Multiplication • Division • Fractions • Decimals • Addition • Subtraction	CC.2.1.HS.F.2 2.1.11.B 13.1.11.D 2.7.11.E:
	Converting between the volume tables of the various log scales.	Converting log volumes between log rules (International, Scribner, Doyle).	3.4.10.A2 2.1.11.B
CHAINSAW OPERATION	Safe operating procedures.	Apply safe handling concepts of chainsaws. • Saw selection • Starting cold and hot saws • Warming up the saw • Chain brake	CC.3.5.9-10B 13.1.11.D
	Proper clothing and safety apparel.	Develop and present a logical argument on the importance of wearing PPEs • Hearing protection • Face screen • Hard hat • Safety glasses • Gloves • Saw safe boots • Chaps • Tight fitting, comfortable clothing	3.4.10.D3
	Directionally felling trees with wedges.	• Investigate the term felling, • Fell a tree with safety in mind. • Comprehend and explain reactive forces of pivot points and pinch points. • Critique the quality of notch, hinge, and back cuts to control where the tree falls.	CC.3.5.9-10B CC.2.3.HS.A.14

Big Idea (Objectives)	Concepts	Competencies	Standard
	Limbing and topping felled trees.	- Investigates the term limbing. - Limb a tree with safety in mind. - Comprehend and explain reactive forces of pivot points, and pinch points.	CC.2.3.HS.A.14 CC.11.12.3
	Measuring and marking felled trees for bucking.	Estimate lengths of bucked logs using their bar and saw as a guideline for 24" lengths.	CC.2.3.HS.A.13
	Bucking cuts.	Apply concepts of bucking cuts and anticipate reactive forces caused by - Bottom cut - Top cut - Plunge cut - Cross grain plunge cut	CC.2.3.HS.A.14 CC.11.12.3
	Splitting and stacking cord wood.	- Compare a hydraulic splitter, mull, and splitting axes. - Interpret how differences in pressure make hydraulics work. - Differentiate between cords and half cords. - Construct properly stacked cords and compare them to improperly stacked cords.	CC.2.1.HS.F.2 CC.11.12.3
CHAINSAW MAINTENANCE	Installing, servicing, and adjusting the chain and bar.	Understand the cause and effect of different wear patterns of the chain and bar and demonstrate how to service them. - Chain tension - Bar grooves - Bar nuts - Oil delivery system - Adjusting pin/screw - Roller tip - Bar rails	3.4.10.D2
	Sharpening the saw chain.	Distinguish the difference in chain sizes. - chain pitch - gauge - length Use concepts to solve non-routine problems. - Hooked cutters - Blunt cutter - Depth gauge - Chipper - Chisel - Half chisel Construct a well and sharpen chain by using a variety of tools.	3.4.12.C3 CC.2.3.HS.A.14 CC.2.3.HS.A.13

Big Idea (Objectives)	Concepts	Competencies	Standard
		• Round file • File guides • Bench mounted chain sharpener • Depth gauge tool • Flat files Critique a chain to ensure proper sharpening angles were used. • 10 degree rise • 30 degree working corner • Correct file size	
	Navigation of the owner's manual.	Use context clues to navigate the owner's manual for needed information. • Chain selection • Special information about saw • Safety awareness • Kickback • Replacement parts • Operation guidelines • Fuel/oil mix • Maintenance schedule	CC.3.5.9-10B 2.5.11. A
	Changing the clutch and rim sprocket.	• Show how to access the clutch and sprocket rim and distinguish differences between the two. • Select the correct parts according to paths and pitches of sprocket rims.	CC.11.12.3
	Servicing the air filter and exhaust system.	• Demonstrate where to locate a filter and be able to remove for cleaning or replacing air filters. • Explain the importance of having a clean air filter.	2.7.11.E:
	Mixing and storing fuel.	• Make observations of correct/safe handling procedures. • Measure fuel and oil to get the correct mixture for a saw.	CC.3.5.9-10.A.
	Performing a pre-operation inspection.	• Demonstrates how to do an advanced pre-operation inspection. • Develop and present a logical argument on the importance of being able to locate and fix the errors of others.	CC.11.12.3
	Replacing a starter rope.	Demonstrate how to remove and replace starter ropes.	CC.11.12.3
	Replacing spark plugs.	• Identify location of a spark plug on a saw. • Demonstrate how to remove a spark plug and inspect it to see if the spark gap is still	CC.11.12.3

Big Idea (Objectives)	Concepts	Competencies	Standard
		good.	
	Adjusting throttle speed.	- Demonstrate how to adjust the idle speed of the throttle. - Develop a logical argument on the dangers of not having the throttle adjusted correctly.	CC.2.1.HS.F.2
CHAINSAW SAFETY	Saw safety features.	- Identify and list all of a saw's safety features. - Analyze different situations relating to how safety features can protect the operator. - Critique the progression of a saw's safety features over the last 50 years.	13.1.11.D
	PPEs	- Recite each of the PPEs that a chainsaw operator should wear at all times. - Use PPEs every time and can explain how they protect the operator and other tasks that those same PPEs are used for.	3.4.10.D3
	Potential hazards in environment.	- Classify and prevent hazards in their environment. - Apply concepts to protect themselves and others. - Describe how these risks transfer to other occupations.	2.5.11. A
	Kickback awareness.	- Create a logical argument and explain why it is important to know about kickback. - Describe the different types of kickbacks. - Liner - Pinch - Out and up - Shows saw's safety features that protect you from kickback as well as the PPEs that an operator should wear to protect themselves from kickback.	CC.2.1.HS.F.2 CC.2.3.HS.A.14 CC.2.3.HS.A.13
TREE ANATOMY AND GROWTH CHARACTERISTICS	Wood tissues.	Identifying functions of wood tissues.	CC.3.5.9-10B
	How trees produce and use food.	Draw conclusions based on the importance of photosynthesis in relation to forestry.	3.4.10.A2
	How trees grow in height and girth.	Compare how trees grow in height and girth. - Crown - Trunk - Branches - Root system	CC.2.3.HS.A.12 CC.2.3.HS.A.14
	Origins of clear and common lumber.	Differentiating between regions and species. Cite evidence on lumber to appraise value and uses.	CC.3.5.9-10B CC.2.3.HS.A.13

Big Idea (Objectives)	Concepts	Competencies	Standard
		• Clear Heart • Heart B • Construction Heart • Construction Common • Select • Clear Vertical Grain (CVG)	
SAWMILLS AND WOOD PRODUCTS	Operating a band sawmill.	Show how produce rough cut dimensional lumber by operating and maintaining the following on the woodmizer. • Head unit • Set works • De-barker • Hydraulics Hypothesize when to turn a log and how much to take off to get the most lumber from log.	3.4.10.D2 CC.2.3.HS.A.13
	Equipment found in sawmills.	Identify and describe the uses of peeve bar, stickers, log loaders, chokers, and files.	2.5.11. A 13.1.11.D
	Processing steps for various wood products.	• Pulp ○ Kraft liner ○ Cellulose ○ Dissolving pulp ○ Paper • Engineered wood. ○ Plywood ○ MDF ○ Oriented strand board • Chemicals ○ Tar ○ Tall oil ○ Wood fuel ○ Phenols ○ Pinene ○ Pine soap • Timber ○ Dimensional lumber ○ 2x4, 1x6, 6x6 2x12 etc.	3.4.12.C3 CC.2.1.HS.F.2 CC.2.3.HS.A.13

Big Idea (Objectives)	Concepts	Competencies	Standard
		- Residuals from timber processing or as first step of mass processing. - Wood chips - Bark chips - Wood pellets - wood shavings	
HYDRAULIC SYSTEMS	Operating procedures of hydraulic systems.	- Tractor - Log truck - Log splitter - Sawmill	2.5.11. A 13.1.11.D
	Hydraulic actuators.	Identify parts of hydraulic actuators. - Cylinder - Spring - Piston - Fluid - Supply and return line - Stern - Control valve	3.4.12.C3 CC.2.3.HS.A.12 2.7.11.E:
	Maintaining hydraulic systems.	Formulate a maintenance schedule using the owner's manual to locate grease points.	3.4.10.D2 CC.2.1.HS.F.2 2.7.11.E:
EQUIPMENT OPERATION	Tractor.	Apply concepts to complete a task safely. - Operating backhoe/front end loader. - Moving felled trees with rubber-tired tractor with skidder winch. - Posthole digger. - Reversing a trailer - PTO Chipper	3.4.10.B1 2.5.11. A
	Log loader.	- Demonstrating safe operation of a log loader. - Binding down a load of logs with chain and binders.	CC.2.3.HS.A.14 2.5.11. A
EQUIPMENT MAINTENANCE	Cooling and electrical systems.	- Assess fluid levels and make appropriate adjustments. - Investigate an electrical problem and draw a conclusion using a meter.	3.4.10.D2 CC.2.3.HS.A.12 2.5.11. A

Big Idea (Objectives)	Concepts	Competencies	Standard
	Engine oil and oil filters.	Make observations of oil levels and show how to change oil and filters when needed	3.4.10.D2
	Diesel fuel systems.	Perform routine maintenance buy bleeding the fuel system as problems arise.	3.4.10.D2
	Fuel filters and/or sediment bowl.	Compare fuel filters and/or sediment bowls from ones that have already been changed and ones that are in need of changing.	3.4.10.D2
	Air cleaners.	Service air cleaners and explain causes of why they need serviced as well as the effect of not servicing them.	3.4.10.D2
	Greasing equipment.	Develop and present a logical argument on the importance of following a routine greasing schedule as stated in the owner's manual.	3.4.10.D2
	Checking tire pressure.	- Perform a visual inspection of tires and use the equipment to get an exact psi amount. - Demonstrate the ability to add or remove air to tires as needed to meet the specifications.	CC.2.3.HS.A.12
SILVICULTURE	Correlate forest site to stand composition and quality.	Develop and present a logical argument on how stands are chosen based on the quality of composition and soil / tree species.	CC.3.5.9-10B
	Silvicultural cutting methods (clear cut, seed tree cut, shelter wood cut, and select cut).	Differentiate between the following cuts: - Clear cut - Seed tree cut - Shelter wood cut - Select cut	3.4.12.C3 CC3.5.11-12.1
	Proper stocking rate/stand density for a particular site.	Determine appropriate spacing between trees to achieve maximum production.	CC.3.5.9-10.A. 2.5.11. A
	Tree regeneration.	Identify the range and site requirements for a particular species.	CC.2.1.HS.F.5 2.5.11. A
	Timber stand improvement project.	Observe the results of a properly completed liberation cut and a poorly completed liberation cut.	CC.3.5.9-10.A. 2.5.11. A
	Determine the age/health of a stand.	Use an increment borer to take a core sample to determine the following: - Age - Sap wood	CC.3.5.9-10.A. CC3.5.11-12.1 2.7.11.E:

Big Idea (Objectives)	Concepts	Competencies	Standard
		• Early wood • Late wood • Spring wood • Summer wood • Growth patterns • Site history	
	Timber marking.	Use concepts to solve non-routine problems by properly marking trees into the following categories: • Saw logs • Long-term residuals • Pulp • Site prep	CC.2.1.HS.F.2 13.1.11.D 2.7.11.E:
FOREST ECOLOGY	Wildlife related ecological concepts.	Apply concepts to • Levels of biological organization • Native species • Keystone • Population viability/ thresholds • Adaptive management • Ecosystem-based management • Protected area • Ecological resilience • Disturbances	3.4.10.B1 2.5.11. A
	Vertebrate pest damage in the woodlot.	Identify girdle trees that have been damaged by vertebrates. • Rabbits • Birds • Squirrels • Moles • Mice • Beaver	CC3.5.11-12.1 2.5.11. A 13.1.11.D
	Management of water runoff and air quality.	• Conservation tillage • Crop nutrition management • Pest management • Conservation buffers • Irrigation water management • Grazing management • Erosion and sediment control	CC.2.3.HS.A.14 2.5.11. A 13.1.11.D

Big Idea (Objectives)	Concepts	Competencies	Standard
	Soil erosion and control laws.	Interpret Soil Erosion and Sediment Control Acts	2.5.11. A 13.1.11.D
	Erosion and sedimentation plan.	Develop land treatment measures, including a schedule of the timing for installation in order to minimize soil erosion and sedimentation.	CC.2.1.HS.F.2 CC3.5.11-12.1
FOREST REGENERATION	Heeling in tree seedlings.	Arrange bare root stock trees to keep them alive when there is no time left to plant before winter.	CC3.5.11-12.1 13.1.11.D
	Planting tree seedlings.	Identify patterns in planting trees. • Unpack your trees • Dig a hole • Plant the tree • Shovel in the remaining soil • Construct a water-holding basin • Soil and mulch around your tree	CC.3.5.9-10B CC.3.5.9-10.C
	Germination tests for seedling operations.	Conduct test to seeds to locate the ones with the greatest chance of germinating. • Float test • Quality inspection	CC3.5.11-12.1 13.1.11.D
	Natural regeneration of hardwoods.	Describe the contributing factors of natural regeneration. • Seed • Advanced regeneration • Stump and root sprouts	CC.2.3.HS.A.13 CC3.5.11-12.1 13.1.11.D
	Thinning operations.	• Perform a selective removal of trees.	CC.3.5.9-10.C CC3.5.11-12.1 2.5.11. A
	Protecting forests from insects, disease, animals, and fire.	Perform certain management actions will help protect their investment by minimizing their forest's risk to damage. • Insecticides • Fungicides • Herbicides • Pesticides • Conservation(hunting) • Controlled burns • Thinning	3.4.12.C3 CC.2.3.HS.A.122. 5.11. A

Big Idea (Objectives)	Concepts	Competencies	Standard
GIS, GPS, MAP AND COMPASS USE	Pacing various terrains.	Memorize how to walk 66' (1 chain). • Uphill • Downhill • Through thickets • Through clear cuts	3.4.10.A2 CC.2.3.HS.A.13
	Measuring distance.	Prove distance using the following tools: • Tape measure • Measuring wheel • Pacing	3.4.10.B1 CC.3.5.H-12.C 2.5.11.A
	Calculating acreage.	Determine the square footage of land.	CC.2.1.HS.F.2 CC.2.3.HS.A.12 CC.3.5.H-12.C
	Reading a sun to compass to the nearest degree.	Prove a way point by using degrees on a compass.	CC.2.3.HS.A.13 2.7.11.E: 2.5.11.A
	Running compass bearings.	• Compare the cause and effect of not using the compass properly. • Hold compass completely flat while keeping it straight in front of your body.	CC.2.3.HS.A.14 2.5.11.A
	Calculating percent slope.	Make observations of slope using the following tools: • Abney level • Clinometer	3.4.10.B1 CC.2.3.HS.A.14 CC.3.5.H-12.C
	Correcting slope distance to horizontal distance.	Running a uniform grade with an Abney level	CC.3.5.9-10.C CC.2.3.HS.A.14
	Retracing a course through open woods.	• Utilizing the sun to compass • GPS	CC.3.5.9-10.C CC.2.3.HS.A.14
	Reading maps.	Interpret map scales and symbols.	CC.2.3.HS.A.13 13.1.11.D 2.5.11.A
	Locating boundary lines with the use of a map, compass, and tape.	• Distinguish boundaries with the use of a compass and compare readings to a GPS. • Investigate what those boundaries are using a GIS program.	3.4.10.B1 CC.2.3.HS.A.14 CC.2.3.HS.A.13

Big Idea (Objectives)	Concepts	Competencies	Standard
OCCUPATIONAL ORIENTATION AND SAFETY	Identifying housekeeping duties.	Perform housekeeping duties based on a teacher-developed log.	3.4.12.A2 13.3.11.A 13.3.11.G
	Follow verbal instructions to complete work assignments and rules.	Complete a variety of tasks based on student engagement and participation.	3.4.12.A2 13.2.11.A 13.3.11.A
	Follow written instructions to complete work assignments and rules.	Complete a variety of tasks based on student engagement and participation.	3.4.12.A2 13.2.11.A 13.3.11.A
	Understanding proper use and inspection of Personal Protection Equipment (PPE).	Demonstrate proper use of PPEs.	CC.3.5.9-10.A. 13.3.11.G
	Identifying work area hazards.	• Demonstrate proper work area operation. • Demonstrate proper use of ventilation equipment. • Understand proper work actions for working in confined spaces.	2.5.11. A 13.3.11.A 13.3.11.G
	Display familiarity with industrial and OSHA safety standards.	Understand MSDS sheets and precautionary labeling.	CC.3.5.9-10.A. CC.3.5.11-12.D CC.3.5.11-12.D 13.3.11.A 13.3.11.G

Masonry

Statement of Organization:

This course is designed to provide instruction in the mixing, pouring, finishing, and curing of concrete as well as placement of concrete masonry units that are integral to the agricultural industry. Students also receive practical experience in the use of the builders/transit level and the operation of a backhoe/front end loader, as they relate to the agricultural industry.

Expected Levels of Achievement:

Students are expected to achieve mastery of the skills and concepts taught by obtaining at least eighty percent (80 %) on all graded materials and projects.

Methods of Evaluation:

Student competence will be assessed through the use of one or more of the following methods:

- written tests
- written quizzes
- observation
- individual projects
- group projects
- checklists

Estimated Instructional Time:

Concrete/masonry is a one credit elective that meets for a minimum of one hundred twenty (120) clock hours and is available to students in grades tenth through twelve.

Technology Integration:

In addition to print resources, on-line resources will be used to supplement instruction for tools/materials that are not readily available, as well as for new procedure and technologies developed in the future.

Big Idea	Concepts	Competencies	Standard
EMPLOYMENT	Masonry careers	Explore careers related to the masonry trade	13.1.11.B CC.3.6.11-12.C. CC.1.3.11-12.I
PREPARING THE BUILDING SITE	Builders/transit level set up	Setting up and leveling the builders/transit level	CC.3.5.9-10.C . 2.1.HS.F.2 CC.3.5.11-12.D.
	Gathering field data	Taking Back Site and Fore Site readings on an elevation rod to calculate slope of agricultural field.	2.1.HS.F.2 CC.3.5.11-12.D. 2.1.HS.F.5
	Utilizing elevation rod readings	Determining Height of Instrument and Elevations on building site	2.1.HS.F.2 . 2.1.HS.F.4
	Using field data	Calculate excavation cut and fill for building site	2.1.HS.F.2 2.1.HS.F.4
	Building layout	Layout and square agricultural building using the 3- 4-5 Pythagorean Theorem.	CC.3.5.9-10.C 2.1.HS.F.2.C . 2.3.HS.A.3 2.1.HS.F.4 CC.2.3.HS.A.7
SITE EXCAVATION	Equipment Safety	State safe operating procedures for tractor/backhoe/front end loader and agricultural implements.	CC.3.5.11-12.D. CC.3.5.11-12.C. CC.3.5.11-12A
	Equipment instrumentation and actuators	List functions of backhoe/front end loader instruments and operating controls	CC.3.5.11-12.D. CC.3.5.11-12.C. CC.3.5.11-12A . CC.1.3.11-12.I
	Efficient equipment operation	Perform safe and efficient operation of the backhoe/front end loader	CC.3.5.11-12.D. CC.3.5.11-12.C. CC.3.5.11-12A
FORMING CONCRETE	Materials used for forms	Identify types and uses of concrete forming materials	CC.3.5.9-10.C CC.3.5.11-12.D. CC.1.3.11-12.I
	Selecting forming materials	Compare and choose forming materials based on advantages/disadvantages of each for a specified job	CC.3.5.9-10.C CC.3.5.11-12.D.
	Form construction	Select forming materials and safely use tools for constructing forms to specifications for a slab	CC.3.5.9-10.C
POURING CONCRETE	Masonry tool identification	Identify tools and their associated uses for casting and finishing concrete	CC.3.5.11-12.D. CC.1.3.11-12.I

Big Idea	Concepts	Competencies	Standard
	Using masonry tools	Demonstrate safe use and maintenance of tools used for casting and finishing concrete	CC.3.5.11-12.D. CC.3.5.11-12.C.
	Types of Portland Cement	List types of Portland Cement and associated uses	CC.3.5.11-12.D.
	Proportioning concrete ingredients	Design concrete mix by calculating water- cement-aggregate ratios	CC.2.3.HS.A.12 CC.3.6.9-10.B
	Reinforcing concrete	Identify reasons, techniques, and materials used for reinforcing concrete	CC.3.6.9-10.B
	Bill of Materials	Given job specifications, estimate volume and cost of concrete and additional construction materials	2.1.HS.F.2 2.1.HS.F.5 CC.2.3.HS.A.12
	Concrete quality	Conduct a slump test of student designed concrete sample	CC.3.5.11-12-12.C
	Pouring a slab/floor	Place, float, finish, and cure concrete in order to maintain agricultural structures and facilities	CC.3.5.11-12-12.C 3.4.10.E.7
CONSTRUCTION WITH MASONRY UNITS	Masonry unit classifications	Identify types and list specifications of masonry units used in construction	CC.3.5.11-12.D.
	Mixing mortar	Measure and mix mortar materials	CC.3.5.9-10.C
	Using block laying tools	Demonstrate safe use and maintenance of tools used for placing masonry units	CC.3.5.11-12.D. CC.3.5.11-12.C.
	Apply mortar to masonry units	Manipulate masons trowel in a sequential order of steps to apply mortar to block	CC.3.5.11-12-12.C
	Constructing a corner	Place, level, and plumb masonry units in the construction of a corner	2.1.HS.F.5
	Constructing a wall	- Place, level, and plumb masonry units to a masons string line. - Construct walls designed for animal enclosures - Construct retaining walls for repair and maintenance of agricultural facility	2.1.HS.F.5
	Constructing a foundation	Place, level, and plumb masonry units in the construction of a foundation for agricultural storage facilities.	2.1.HS.F.5

Plumbing/ Industrial Electricity

Statement of Organization:

This course is designed to provide theory as well as practical experience in basic plumbing and industrial control circuitry as it pertains to the agricultural and mechanics and construction industry. The plumbing portion of the course requires students to select plumbing materials, and then use the proper tools for the completion of projects. The electricity portion requires students to use schematics for connecting and troubleshooting industrial control circuitry commonly found in the construction industry.

Expected Levels of Achievement:

Students are expected to achieve mastery of the skills and concepts taught by obtaining at least eighty percent (80%) on all graded materials and projects.

Methods of Evaluation:

Student competence will be assessed through the use of one or more of the following methods:

- written tests
- written quizzes
- performance tests
- observation
- projects

Estimated Instructional Time:

Plumbing/industrial electricity is a half credit elective that meets for sixty (60) clock hours and is available for students in grades ten through twelve.

Technology Integration:

In addition to print resources, on-line resources will be used to supplement instruction for tools/materials that are not readily available, as well as for new procedures and technologies developed in the future.

Big Idea	Concepts	Competencies	Standard
EMPLOYMENT	Careers	- Realize the importance of developing vocational skills required for entrance into the plumbing/electricity trade - Select career options based on interests and aptitudes	13.1.11.B CC.3.6.11-12.C. CC.1.3.11-12.I
SAFETY	Shop safety	- List safety rules and practice safe work habits in the plumbing/electricity lab - Identify and correct environmental hazards in the plumbing/electricity lab	CC.3.6.11-12.C. CC.3.6.11-12.B CC.3.5.11-12.A
CURRENT ELECTRICITY	Ohms law	- Utilizing volt/amp/ohm meters, measure the magnitude of voltage, amperage, and resistance - Understand the mathematical relationship between electrical units by solving assigned circuit analysis problems	CC.3.6.11-12.G. 3.2.10.B4 CC.3.5.11-12.C 2.1.HS.F.2 2.1.HS.F.5 2.1.HS.F.4 2.2.HS.D.1 CC.3.5.11-12.D
INDUSTRIAL POWER SUPPLY	Three phase panelboards	Utilizing a voltmeter, identify and measure the voltages of a three-phase delta power supply	CC.3.6.11-12.G. CC.3.5.11-12.C CC.3.5.11-12.D
	Three phase transformers	- Bank power transformers into delta configuration to obtain assigned voltages - Bank power transformers into wye configuration to obtain assigned voltages	3.2.10.B2 CC.3.5.11-12.C CC.3.5.9-10.G CC.3.5.11-12.D
	Three phase motors	- Find voltage rating, amperage rating, horsepower rating, service factor, and connection schematics on motor nameplate - Connect and troubleshoot three phase motors	CC.3.6.11-12.G. 3.2.10.B2 CC.3.5.11-12.A CC.3.6.11-12.B
MANUAL MOTOR CONTROL	Manual motor starters	Interpret schematics to properly connect a manual motor starter and three phase motor for manual operation	3.4.10.D2. CC.3.5.11-12.D CC.3.5.9-10.G CC.3.5.11-12.C
	Drum switches	Interpret schematics to properly connect a drum switch and three phase motor for forward and reverse operation	CC.3.5.9-10.G 3.4.10.D2. CC.3.5.11-12.D CC.3.5.11-12.C
MAGNETIC MOTOR CONTROL	Magnetic motor starters	Follow schematics to properly connect limit switches, magnetic motor starter and three phase motor for automatic operation	CC.3.5.11-12.D CC.3.5.9-10.G CC.3.5.9-10.G 3.4.10.D2. CC.3.5.11-12.C

Big Idea	Concepts	Competencies	Standard
	Circuit logic	Utilize line diagrams, start/stop stations, and control relays to connect circuits with logic function	CC.3.5.9-10.G CC.3.5.11-12.D 3.4.10.D2. CC.3.5.11-12.C
	Time delay	Utilize line diagrams, on-delay timers, off- delay timers, and cycle timers to connect circuits with time delay functions	CC.3.5.11-12.D CC.3.5.9-10.G 3.4.10.D2. CC.3.5.11-12.C
PIPE FITTING	Pipe fitting tools	- Identify the characteristic and describe the associated uses of basic plumbing tools - Demonstrate safe operation of basic plumbing tools	CC.3.5.11-12 A CC.3.5.11- 12.B.
	Basic pipe fittings	- Identify basic pipe fittings - Describe the use and purpose of each of the basic pipe fittings	CC.3.5.11-12.B. CC.3.5.11-12 A
	Copper pipe	- Identify and list uses and specifications for different types of copper pipe - Complete a copper pipe project of assigned specifications using the proper plumbing tools and associated materials	CC.3.5.11-12.D. CC.2.3.HS.A.13 CC.3.5.11-12 A 2.1.HS.F.5 2.1.HS.F.4 2.1.HS.F.2
	Steel pipe	- Identify and list uses and specifications for different types of steel pipe - Complete a steel pipe project of assigned specifications using the proper plumbing tools and associated materials	CC.3.5.11-12.D. CC.3.5.11-12 A 2.1.HS.F.5 2.1.HS.F.4 CC.2.3.HS.A.13 2.1.HS.F.2
	Plastic pipe	- Identify and list uses and specifications for different types of plastic pipe - Complete a plastic pipe project of assigned specifications using the proper plumbing tools and associated materials	CC.3.5.11-12.D. CC.3.5.11-12 A CC.2.3.HS.A.13 2.1.HS.F.5 2.1.HS.F.4 2.1.HS.F.2
HOME PLUMBING	Water closet	- Install/replace a water closet - Perform repairs to a water closet	CC.3.5.11-12.C. CC.3.6.11-12.G. 3.4.10.D2.
	Faucet	- Install/replace a kitchen/bathroom faucet - Perform repairs to a kitchen/bathroom faucet	CC.3.5.11-12.C. CC.3.6.11-12.G. 3.4.10.D2.

Residential Wiring

Statement of Organization:

This course is designed to provide students with general knowledge in theory as well as practical experience in residential circuitry. This course involves the safe wiring and operating of electrical circuits of various complexities, meter reading, computing electrical costs for everyday appliances, occupational work hazards, occupations and continuing education for residential electricity, practical in-home DYOW fixes, the effect electricity has on the human body, and also how electricity behaves in different environments in order to learn how to stay safe in case of an electrical hazard/ emergency.

Expected Levels of Achievement:

Students are expected to achieve mastery of the skills and concepts taught by obtaining at least eighty percent (80%) on all graded materials and projects.

Methods of Evaluation:

Student competence will be assessed through use of the following methods:

- Teacher-made test graded with answers keys
- Student engagement and participation
- Skill-based projects graded with rubrics
- Demonstrations

Estimated Instructional Time:

Residential Wiring is a one-half credit elective which meets for a minimum of sixty (60) clock hours. It is available to eleventh and twelfth graders and is required for students in the Vo-AG graduation track.

Technology Integration:

In addition to print resources, students will use technology to create electronic documents for the purpose of presentations and research. Students will also use a variety of meters to take readings of measurable electrical activity and electrical potential.

Big Idea	Concepts	Competencies	Standard
OCCUPATIONAL ORIENTATION AND SAFETY	Identifying daily housekeeping duties.	Perform housekeeping duties daily based on a teacher- developed log.	3.4.10.D3 13.3.11.A 13.3.11.G
	Follow verbal instructions to complete work, assignments, and follow rules.	Completing tasks based on student engagement and participation.	3.4.12.A2 13.2.11.A 13.3.11.A
	Follow written instructions to complete work, assignments, and follow rules.	Completing tasks based on student engagement and participation.	3.4.12.A2 13.2.11.A 13.3.11.A
	Understanding proper use and inspection of Personal Protection Equipment (PPE).	Daily demonstration.	13.3.11.A 13.3.11.G
	Identifying work area hazards.	• Demonstrate proper work area operation. • Demonstrate proper use of ventilation equipment. • Understand proper work actions for working in confined spaces.	3.4.12.A2 13.3.11.A 13.3.11.G
	Display familiarity with industrial and OSHA safety standards.	Understand MSDS sheets and precautionary labeling.	3.4.10.D3 CC.3.5.9-10B CC.3.5.11-12.D 13.3.11.G
INTRODUCTION TO ELECTRICITY	Identify tools used in the electrical trade.	Screwdriver Cable rippers Wire cutters Needle nose pliers Cable connectors Electrical boxes New build/re-build boxes Metal vs plastic boxes Wire strippers Drill drivers	2.5.11. A 13.1.11.D CC.11.12.3
	Recognize characteristics of circuit electricity.	• Critique the path of electricity. • Understanding of ground. • Identifying hot, return, travelers and ground wires. • Distinguishing the difference between types of conductors and resisters. • Explain a short circuit. • Explain an overloaded circuit. • Describe the effect of an incomplete circuit.	CC.2.3.HS.A.14 CC.11.12.3 2.7.11.E

Big Idea	Concepts	Competencies	Standard
	Comprehend the mathematical relationship between electrical units.	- Solving electrical problems using Ohm's law. - Computing wattage. - Computing electrical cost from volts and amps. - Cost-to-job relationship.	3.4.10.A2 CC.2.1.HS.F.2 2.7.11.E
	Electrical meters.	- Understanding similarities across electrical gas and water meters. - Demonstrate how to accurately read a reading kilowatt hour meter. - Critique how one dial in a meter affects the other.	3.4.10.A2 3.4.10.D2 CC.2.1.HS.F.2 2.7.11.E
RESIDENTIAL CIRCUITRY	Wiring three-way switches, lights, and receptacles.	- Understand the path electricity takes through various circuits. - Determine when it is necessary to use 3-conductor v. 2-conductor Romex. - Apply Blueprint reading to residential wiring projects. - Understand the important of correct wiring practices such as good connections and striping wires to proper length.	CC.3.5.9-10.C CC.3.5.11-12.D CC.3.5.H-12.C CC3.5.11-12.1 2.7.11.E
	Wiring single pole switches, lights, and receptacles.	- Understand the path electricity takes through various circuits. - Determine when it is necessary to use 3-conductor v. 2-conductor Romex. - Apply Blueprint readings to residential wiring projects. - Understand the importance of correct wiring practices such as good connections and striping wires to proper length.	CC.3.5.9-10.C CC.3.5.11-12.D CC.3.5.H-12.C CC3.5.11-12.1 2.7.11.E
	Wiring four-way switches, lights, and receptacles.	- Recognize the path electricity takes through various circuits. - Determine when it is necessary to use 3-conductor v. 2-conductor Romex. - Apply Blueprint readings to residential wiring projects. - Understand the important of correct wiring practices such as good connections and striping wires to proper length.	CC.3.5.9-10.C CC.3.5.11-12.D CC.3.5.H-12.C CC3.5.11-12.1 2.7.11.E
	Wiring service entrance panels.	- Describe appropriate amperage and volts for circuit. - Select the correct gauge wire for different circuits. - Distinguish the difference between independent and complex circuits. - Demonstrate how to get 110 220-volt circuits. - Explain how much load can be put on one circuit.	CC.3.5.9-10.C CC.3.5.H-12.C CC3.5.11-12.1

Big Idea	Concepts	Competencies	Standard
ELECTRICITY IN OUR ENVIRONMENT	Overhead / underground supply lines.	- Awareness of the hazards when operating equipment. - List numbers to call 811, 911. - Stay away.	3.4.10.A2 CC.3.5.9-10.A. 2.5.11. A
	Step potential.	- When stuck in an energized vehicle how to get out safely. - Describe how step potential works. - How to minimize humans step potential. - Describe how step potential differs in large and small 4-legged animals as well as humans. - Illustrate how electricity radiates out through the ground when energized.	3.4.12.C3 2.1.11.B CC.11.12.32.7.1 1.E
	Weather-related emergencies.	- Illustrate how negatively charge electrons pass through the air to the ground to cause lightning. - Critique how a welding arc is similar to lightning. - Explain how heavy ice can cause electrical emergencies. - Identify hazard trees around powerlines. - Explain procedures for when a transformer blows.	3.4.10.D2 CC.3.5.9-10B
	Effects of electricity on the human body.	- Describe how to prevent electrical emergencies. - Static shock. - Tasers. - Describe the relationship of volt amps and time to induce a lethal amount. - Shock tringle - Time - Current - Path	3.4.12.C3 CC.3.5.9-10.A. 2.1.11.B 2.7.11.E
MEASURING ELECTRICITY TERMINOLOGY	Volts	- Describe how a volt is the pushing force in a circuit. - Use a voltmeter to measure volts in a circuit.	CC.2.1.HS.F.5 CC.2.1.HS.F.2 CC.3.5.11-12.D
	Amps	- Describe how an amp is the amount of current in a circuit. - Use an amp meter to measure amps in a circuit.	3.4.12.C3 CC.2.1.HS.F.5 CC.2.1.HS.F.2 CC.3.5.11-12.D
	Watts	- Determine the relationship of volts and amps to get watts. - Identify how watts are used to measure the amount of energy consumed. - Explain how we are billed for electrical services,	CC.3.5.9-10B CC.2.1.HS.F.5 CC.2.1.HS.F.2 CC.3.5.11-12.D

Big Idea	Concepts	Competencies	Standard
	Ohms	Unit of electrical resistance and expressing the resistance in a circuit. Symbol: Ω Ohm's Law is a formula used to calculate the relationship between voltage, current and resistance in an electrical circuit.	CC.3.5.9-10.A. CC.2.3.HS.A.12 CC.2.1.HS.F.1 CC.2.1.HS.F.2 CC.3.5.11-12.D
	Joules	The standard unit of work or energy. One joule is equal to the work done by the force of a single newton when its point of application travels through a distance of 1 meter in the same direction as the force.	CC.3.5.9-10.A. CC.2.3.HS.A.12 CC.2.1.HS.F.1 CC.2.1.HS.F.2 CC.3.5.11-12.D

Small Gas Engines

Statement of Organization:

This course is a study of single cylinder, air cooled, Internal Combustion Engines commonly found in the agriculture industry. Students not only receive instruction in basic mechanics theory, but also have the opportunity to make basic repairs, perform maintenance, troubleshoot engine systems, and perform engine overhauls.

Expected Levels of Achievement:

Students are expected to achieve mastery of the skills and concepts taught by obtaining at least 80% on all graded materials and projects.

Methods of Evaluation:

Student competence will be assessed through the use of one or more of the following methods:

- Observation
- Guided practice
- Projects
- Performance tests
- Written quizzes
- Written tests

Estimated Instructional Time:

Small Gas Engines is a one credit elective course which meets for a minimum of 120 clock hours and is available for students in grades nine through twelve.

Technology Integration:

In addition to print resources, on-line resources will be used to supplement instruction for tools/materials that are not readily available, as well as for new procedures and technologies developed in the future.

Big Ideas	Concepts	Competencies	Standard
EMPLOYMENT	Careers in mechanics	- Explore careers in the field of agricultural mechanics - Understand the relationship between academic and agricultural careers and success.	13.1. 11.B 13.1. 11. D 13.1.11.F CC.3.6.9-10.B
SAFETY	Shop safety	- List and demonstrate safe practices in the agricultural mechanics lab - Exhibit proper use/maintenance of tools in found in the agricultural mechanics lab.	CC.3.5.9-10.D. CC.3.6.9-10.B CC.3.5.11-12.B. CC.3.5.9-10.D. CC.3.5.9-10.C CC.3.5.9-10.B.
ENGINE CYCLES	Four stroke engine cycle	List in sequence the events that take place in a four-cycle engine along with a description of each event	CC.3.5.9-10.G CC.3.5.9-10.J CC.1.3.9-10.I CC.3.5.9-10.B.
	Two stroke cycle engines	List in sequence the events that take place in a two-cycle engine along with a description of each event	CC.3.5.9-10.G. CC.3.6.9-10.B CC.3.5.9-10.J CC.3.5.9-10.B.
ENGINE IGNITION SYSTEMS	Ignition system parts	Identify and describe the functions of small engine ignition parts	CC.3.5.9-10.D. CC.3.5.9-10.B. CC.3.5.9-10.J CC.1.3.9-10.I
	Ignition system specifications	Assemble and adjust ignitions system components by locating specifications in manufacturers repair manuals	CC.3.5.9-10.C CC.3.5.9-10.J
	Repairing ignition systems	Repair and/or replace ignition system components based on recommended troubleshooting procedure found in manufacturers repair manuals	CC.3.5.9-10.C CC.3.5.9-10.J C C . 3.4.10.D.2
ENGINE FUEL SYSTEMS	Fuel system parts	Identify and describe the functions of small engine carburetor and fuel system parts	CC.3.5.9-10.J CC.3.5.9-10.B. CC.1.3.9-10.I
	Fuel system specifications	Assemble and adjust a float carburetor by locating specifications in manufacturers repair manuals	CC.3.5.9-10.C CC.3.5.9-10.J
	Repairing fuel systems	Repair and/or replace carburetor and fuel system parts based on recommended troubleshooting procedure found in manufacturers repair manuals	CC.3.5.9-10.C CC.3.5.9-10.J C C . 3.4.10.D.2

Big Ideas	Concepts	Competencies	Standard
ENGINE MAINTENANCE	Maintain cooling system	Utilize compressed air to clean debris from engine cylinder and head	CC.3.5.9-10.B. CC.3.5.9-10.C C C . 3.4.10.D.2
	Maintain air cleaner	Inspect and service oil wetted, dry element, and dual element air cleaners	CC.3.5.9-10.C CC.3.5.9-10.B.
	Maintain crankcase ventilation	Inspect and service crankcase breathers	CC.3.5.9-10.C CC.3.5.9-10.B.
	Maintain spark plugs	Clean spark plug electrodes and gap to recommended specification with the use of a feeler gauge	CC.3.5.9-10.C CC.3.5.9-10.B.
	Maintain lubrication system	Perform an engine oil change with replacement oil of proper type and viscosity	CC.3.5.9-10.C CC.3.5.9-10.B.
	Maintain engine governor	- Check mechanical governor linkages and springs for wear and evaluate for replacement based on specifications found in manufacturers repair manuals - Check pneumatic governor linkages and springs for wear and evaluate for replacement	CC.3.5.9-10.C CC.3.5.9-10B CC.3.5.9-10.A. CC.3.5.9-10.J
	Maintain lead acid battery	Check the condition of a lead acid battery with a multimeter and/or a hydrometer and service or replace battery	CC.3.5.9-10.C CC.3.5.9-10.B.
	Power tune-up	Remove carbon deposits from the combustion chamber and cylinder head with manufacturers recommended tools	CC.3.5.9-10.C C C . 3.4.10.D.2
ENGINE OVERHAUL	Compression Analysis	Perform an engine compression test with the aid of an engine compression tester and evaluate with specifications found in manufacturers repair manuals	CC.3.5.9-10.A. CC.3.5.9-10.J
	Bearings and bearing journals	Utilize micrometers, calipers, and telescoping gauges to measure crankshaft/camshaft bearings and journals to evaluate their condition for replacement based on specifications found in manufacturers repair manuals	CC.3.5.9-10.C CC.3.5.9-10.A. CC.2.1.HS.F.2 CC.2.1.HS.F.4 CC.2.1.HS.F.5
	Engine valves	- Use valve seat cutters, valve facing tools, and valve lapping tools to perform an engine valve job - Check and adjust valve tappet clearance based on specifications found in manufacturers repair manuals - Identify/ check/ adjust overhead valve engine (OHV) found in manufacturers repair manuals	CC.3.5.9-10.C CC.3.5.9-10.A. CC.3.5.9-10.J

Big Ideas	Concepts	Competencies	Standard
	Engine rings	- Utilize piston ring expanders and piston ring compressors for the removal/installation of piston rings - Measure ring end gap and ring groove side clearance with the use of a feeler gauge and evaluate for replacement	CC.3.5.9-10.C CC.3.5.9-10.A.
	Engine pistons	- Utilize micrometers, calipers, and telescoping gauges to measure pistons and evaluate their condition for replacement based on specifications found in manufacturers repair manuals - Use a piston ring groove cleaner to remove carbon deposits from piston ring grooves - Evaluate the condition of piston ring lands and piston skirts based on specifications found in manufacturers repair manuals	CC.3.5.9-10.C CC.3.5.9-10.A. CC.2.1.HS.F.2 CC.3.5.9-10.J CC.2.1.HS.F.4 CC.2.1.HS.F.5
	Engine cylinders	- Utilize micrometers, calipers, and telescoping gauges to measure cylinders and evaluate their condition based on specifications found in manufacturers repair manuals - Utilize a cylinder hone to deglaze a cylinder bore - Given cylinder bore and stroke, calculate cylinder displacement - Define and give examples of engine compression ratios	CC.3.5.9-10.C CC.3.5.9-10.A. CC.2.1.HS.F.2 CC.2.1.HS.F.4 CC.3.5.9-10.J CC.2.1.HS.F.4 CC.2.1.HS.F.5 CC.2.3.HS.A.12 CC.2.3.HS.A.13

Welding/Oxyacetylene

Statement of Organization:

This course is designed to teach students entry-level skills for welding occupations and their application to the Agricultural Mechanics field. Students receive training in electric arc, MIG and TIG welding, the use of a plasma cutter as well as oxyacetylene cutting, welding, and brazing. In addition, students will be introduced to hand tools and power equipment used in metal working and blacksmithing. Students choosing to enter the Agricultural Mechanics or Forestry Vocational track are required to take this course.

Expected Levels of Achievement:

Students are expected to achieve mastery of the skills and concepts taught by obtaining at least 80% on all graded materials and projects.

Methods of Evaluation:

Student learning will be assessed in the following methods:

- Teacher-made tests graded with answers keys
- Student engagement and participation
- Skill-based projects graded with rubrics
- Demonstrations

Estimated Instructional Time:

Welding/Oxyacetylene is a one credit elective which meets for a minimum of one hundred twenty (120) clock hours and is available to tenth through twelfth graders.

Technology Integration:

In addition to print resources, students will use technology to create electronic documents for the purpose of presentations, research. Students will also utilize various forms of technology related to welding and fabrication in the agricultural field, such as sensors and automated tools.

Big Idea	Concepts	Competencies	Standard
PRINCIPLES OF AGRICULTURAL WELDING.	Basic principles of heat, expansion, and contraction as it relates to metals and distortion.	- Analyze and predict distortion in projects. - Select appropriate welding technique, equipment, and supplies for a given metal or process.	3.4.12.C3 CC.3.5.9-10.A. CC.11.12.3 13.3.11.G 2.7.11.E:
	Various joint designs (joint geometry).	Compare and construct T-joints, Lap joints, butt joints open V-joints and design projects using these joints.	3.4.10.B1 CC.3.5.9-10.C CC.2.1.HS.F.2 CC.2.3.HS.A.14 2.7.11.E:
	Various welding positions.	Summarize the geometric relationship of stock and ARC that Differentiate Flat, Horizontal, vertical, overhead positions.	3.4.12.A2 CC.3.5.9-10B CC.2.3.HS.A.14 2.7.11.E:
	Clean and prepare materials for welding and/or cutting blacksmithing.	- Assess and demonstrate proper use of hand tools and power equipment. - Construct projects using proper standards of measurement and layout tools.	3.4.12.A2 CC.3.5.H-12.C CC.11.12.3
	Compare and contrast the differences that Polarities have (AC, DC+, DC-).	- Critique which polarity is needed for the given welding process. - Understand what part of the welding circuit creates enough resistance to make the arc - Distinguish whether the stock or the electrode get hotter and select the proper polarity for the given task.	3.4.10.B1 CC.3.5.9-10.A. 13.1.11.D 2.7.11.E:
OCCUPATIONAL ORIENTATION AND SAFETY	Identifying housekeeping duties daily.	Perform housekeeping duties based on occupational standards for trade work	CC.3.5.9-10.A CC.3.6.9 13.3.11.A 13.3.11.G
	Follow verbal instructions to complete work assignments and rules.	Completing tasks requiring student engagement and participation.	CC.3.5.9-10B 3.4.12.A2 13.2.11.A 13.3.11.A
	Follow written instructions to complete work assignments and rules.	Completing tasks requiring student engagement and participation.	3.4.12.A2 13.2.11.A
	Understanding proper use and inspection of Personal Protection Equipment (PPE).	Demonstrating daily.	13.3.11.A

Big Idea	Concepts	Competencies	Standard
	Identifying work area hazards.	- Demonstrate proper work area operation. - Demonstrate proper use of ventilation equipment. - Understand proper work actions for working in confined spaces.	CC.3.5.9-10.A. 2.5.11. A 13.3.11.A 13.3.11.G
	Display familiarity with industrial and OSHA safety standards.	Understand MSDS sheets and precautionary labeling.	CC.3.5.11-12A 3.4.10.D3 13.3.11.A 13.3.11.G
SHIELDED METAL ARC WELDING (SMAW).	Set up and operate SMAW equipment.	- Perform safety inspections of SMAW equipment and accessories. - Make minor external repairs to SMAW equipment and accessories.	CC.3.5.9-10.C 13.1.11.D CC.3.5.11-12A
	Striking and maintaining an arc.	- Determine proper arc length, rod angle, and speed of travel. - Perform at acceptable skill level based on teacher-made rubric	CC.3.5.11-12.C. CC.2.3.HS.A.14 CC.11.12.3
	Running a bead.	Determine proper arc length, rod angle, and speed of travel by demonstration of touching and overlapping beads graded by teacher-made rubric.	CC.3.5.9-10.A. CC.2.3.HS.A.14 2.7.11.E
	Joining metal.	Selection of proper electrode, determine proper arc length, rod angle, speed of travel and sequence of beads for T-joint, Lap joint, open V-joint, and butt joint.	CC.3.5.9-10.C CC.2.1.HS.F.2 CC.2.3.HS.A.14 2.7.11.E:
METAL INERT GAS WELDING (MIG).	Set up and operate MIG equipment.	Investigate ranges of wire fed speed and voltage and modify equipment to get the correct bead size for the given metal by adjusting the machines settings.	3.4.10.A2 CC.3.5.9-10B CC.11.12.3 13.1.11.D
	Make minor external repairs to MIG equipment and accessories.	Understand the cause and effect of machine use in relation to needing replaced.	3.4.10.D2 2.5.11. A
	Striking and maintaining an arc.	Determine proper arc length, wire angle, and speed of travel. Perform at acceptable skill level based on teacher-made rubric.	CC.3.5.9-10.C CC.2.3.HS.A.14 2.7.11.E:
	Running a bead.	Determine proper arc length, wire angle, and speed of travel by demonstration of touching and overlapping beads graded by teacher-made rubric.	CC.3.5.9-10.A. CC.2.3.HS.A.14 2.7.11.E:

Big Idea	Concepts	Competencies	Standard
TUNGSTEN INERT GAS (TIG)	Set up and operate TIG equipment.	Modify equipment to get the correct bead size for the given metal by adjusting the machine settings.	3.4.10.A2 CC.3.5.9-10B CC.11.12.3 13.1.11.D
	Make minor external repairs to TIG equipment and accessories.	Understand the cause and effect of machine use in relation to needing replaced.	3.4.10.D2 CC.3.5.H-12.C 2.5.11. A
	Striking and maintaining an arc.	Determine proper arc length, electrode, and filler rod angle, and speed of travel performed at acceptable skill levels based on student engagement and participation.	CC.3.5.9-10.C CC.2.3.HS.A.14 2.7.11.E:
	Running a bead.	Determining proper arc length, electrode and filler rod angle, and speed of travel by demonstrating a series of beads based upon student engagement and participation.	CC.3.5.9-10.A. CC.2.3.HS.A.14 2.7.11.E:
MANUAL OXYFUEL GAS CUTTING, WELDING, BRAZING, AND HEATING	Operate manual OXYFUEL equipment.	Demonstrate proper cutting, heating, welding, and brazing techniques.	CC.3.5.9-10B 13.1.11.D CC.3.5.H-12.C CC.11.12.3
	Make minor external repairs to OxyFuel equipment and accessories.	Understand the cause and effect of machine use in relation to needing replaced.	3.4.10.D2 2.5.11. A
MANUAL PLASMA ARC CUTTING (PAC)	Set up and operate manual PAC operations.	Perform shape cutting and gouging operations.	3.4.10.A2 CC.3.5.9-10.C 13.1.11.D
	Make minor external repairs to PAC equipment and accessories.	Understand the cause and effect of machine use in relation to consumables needing replaced.	3.4.10.D2 2.5.11. A
PRODUCTION	Welding, drawing, and weld symbol interpretation	- Interpret basic elements of a drawing or sketch. - Interpret welding symbol information. - Fabricate parts from a drawing or sketch (class project). - Demonstrate knowledge of basic metric conversion. - Identify structural metals used in the Metal Fabrication field.	CC.11.12.3 13.1.11.D
	Visual examination, inspection, and testing	- Evaluate cut surfaces and edges of prepared base metal parts for testing. - Identify and evaluate weld discontinuities as per accepted/rejected criteria. - Demonstrate visual inspection and destructive and non-destructive techniques.	CC.11.12.3 13.1.11.D