Introduction to Agriculture Engineering

Grades 9-12

Unit 1

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		2 weeks

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Agricultural Technical Systems and Safety
Unit Summary	Agricultural mechanics provide important services to the agricultural industry. Agricultural mechanics must have the technical skills, aptitude, and ability to perform technical work using various systems and equipment. Skills are needed in several areas to perform various types of work, including carpentry, plumbing, electrical, and welding work and work on hydraulic and pneumatic systems, motorized power equipment, and sustainable energy systems. Before performing any type of work, agricultural mechanics must have a thorough understanding and the ability to successfully apply all safety procedures. Practicing proper safety procedures protects individuals from harm and properly and equipment from damage.

Unit Essential Questions:	**Key understandings:**
• How do I ensure that both I and my classmates are using safety precautions and practices while working in the shop? • What career interest do you have? What training or education is needed? What skills? Type of work involved? Is your interest a career for you?	• Safety and Health • Career opportunities • Agricultural student leadership organizations • Skills for employability

Focus Standards Addressed in the Unit:

Standard Number	***Standard Description***
CPR.10.01.02.a	Examine career clusters and identify potential career opportunities based on personal interests, talents, goals, and preferences.
PST.02.02.02.b	Apply safety principles and applicable regulations to operate equipment, machinery, and power units used in AFNR power, structural and technology systems.
CRP.10.02.02.a	Identify methods for setting goals for personal improvement and continuous growth in a career area.

Important Standards Addressed in the Unit:	
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes
CC.3.6.9-10.H.	Draw evidence from informational texts to support analysis, reflection, and research.
CC.3.5.9-10.B.	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
CC.3.5.9-10.D.	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently

Misconceptions:	Proper Conceptions:
• All careers need a 4 year college degree. • Safety is only a concern for those performing the work.	• Jobs come with many different levels of education requirements. Many only need on the job training or a technical degree. • Agricultural accidents can affect all that are nearby whether they be chemical, fire, or mechanical.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● dangers in an agricultural mechanics shop and work place. ● safety colors used on signs and icons in the agriculture industry ● Identify and use proper firefighting equipment ● Career opportunities	● List safety procedures that promote avoidance of shop hazards and accident reduction ● Identify and demonstrate wearing of personal protective equipment. ● Demonstrate positive safety attitudes and responsibilities ● Demonstrate safety rules and regulations ● Describe regulations, safety and consumer protection ● Demonstrate first aid methods and procedures using supplies in a first aid kit ● Identify career pathways and education requirements	● Curiosity ● Learning to learn

Academic Vocabulary:

- Agriculture
- Portfolio
- Career objective
- Resume
- Networking
- Grounding
- Ground-fault circuit interrupter (GFCI)
- Lockout and tagout
- Occupational Safety and Health Administration (OSHA)
- Environmental Protection Agency (EPA)
- Personal protective equipment (PPE)
- Chemical hazard
- Spontaneous combustion
- Bonding
- Firstaide
- Confined space
- Carbon Monoxide
- Hazardous material
- NFPA hazard signal system
- Flammability hazard
- Hazardous Material Identification Guide (HMIG)
- Asbestos
- Blood borne pathogen
- Electrical shock

Assessments:

- Test
- Quizzes
- Participation
- Check points

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit introduces many of the different agricultural systems found in industry. In all of those industries safety is the most important thing. Students can use skills learned in this unit for everyday life in the aspects of safety. Also as they progress through their high school career they will need to make choices about career opportunities.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

Created By:

Troy Summey

Introduction to Agriculture Engineering

Grades 9-12

Unit 2

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		2 weeks

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Tools and Equipment
Unit Summary	Most, if not all, tasks in agricultural environments require the use of hand tools, portable power tools, and stationary power tools. Proper use of tools requires that an agricultural mechanic know how the tool is to be used for specific task, how the tool is to be maintained, and how the tool is to be stored. An agricultural mechanic must also have an understanding of protective equipment requirements and when to take a tool out of service and replace it with a new tool.

Unit Essential Questions:	**Key Understandings:**
• How do tools affect your everyday life? Do they make task easier to complete? What tools have you used today?	• Hand tool and power tool identification • Safe use and handling of power tools • Safe use of stationary power equipment • Proper use of all tools and equipment

Focus Standards Addressed in the Unit:

Standard Number	***Standard Description***
PST.02.02.02.b	Apply safety principles and applicable regulations to operate equipment, machinery, and power units used in AFNR power, structural and technology systems.
CS.03.04.	Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.
PST.01.02.02.a	Identify the tools, machines and equipment needed to construct and/or fabricate a project in AFNR

Important Standards Addressed in the Unit:	
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.3.5.9-10.J.	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Misconceptions:	Proper Conceptions:
• Tools can be used however they see fit, for any job.	• Tools are designed to perform certain task and can cause serious injury if used improperly.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Identification of hand tools and power tools and their uses ● various gauges and testers used in agricultural power equipment	● Describe regulations, safety and consumer protection. ● Identify, select, adjust, maintain and safely use common hand tools and power tools ● Demonstrate proper and safe use of air operated equipment ● Adjust, maintain and safely use electrical powered shop equipment ● Demonstrate accurate use of measurement devices and techniques for calculating measurement including the metric system	● Curiosity

Academic Vocabulary:		
● Hand tool	● Center point test	● Radial arm saw
● Level surface	● Circular saw	● Table saw
● Tap	● Jigsaw	● Miter saw
● Die	● Reciprocating saw	● Chop saw
● Jointing	● Drill bit	● Band saw
● Whetting	● Hammer drill	● Drill press
● Belt sander	● Rotary hammer	● Lathe
● Finish sander	● Impact wrench	● grinder
● Pneumatic nailer	● Power screwdriver	
● Powder-actuated tool	● Portable power plane	
● Power load	● Portable power router	

Assessments:

- Test
- Quizzes
- Participation
- Check points

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- After learning all the types of tool, power tools and equipment students can then determine the proper tool for the job at hand. Through this they develop problem solving skills which they can use in all classes and life. They can use the tools to make their job easier. Knowing the operation or the use of the tool is important to do the job properly and keep having an accident.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

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Introduction to Agriculture Engineering

Grades 9-12

Unit 3

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		1 week

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Materials and Fasteners
Unit Summary	Material selection is an important part of component design and repair. Materials and their properties determine size, shape and thickness a component needs for its intended function. Materials commonly used are wood, metal, and plastics. Fasteners are components used for attaching parts in an assembly. Fasteners are available in a variety of material types. Having knowledge about common materials and their associated fasteners aids the agricultural mechanic in fabrication and repair of equipment.

Unit Essential Questions:	**Key Understandings:**
• Why is it important to select correct material and fasteners when constructing a project?	• Lumber selection and application • Metal selection and application • Fastener identification and application

Focus Standards Addressed in the Unit:

Standard Number	*Standard Description*
PST.04.03.03.a	Compare and contrast the characteristics of wood and/or metal products used in AFNR structures.
PST.04.03.01.c	Select materials for a project base upon an analysis of the project and the quality of the materials.

Important Standards Addressed in the Unit:	
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.3.5.9-10.J.	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Misconceptions:	• Proper Conceptions:
• Does not matter if a fastener is designed for wood or metal as long as it holds two things together. • Wood is wood and metal is metal.	• Fasteners have specific strengths and designed for specific uses. • Wood comes in different types and also different grain structures. • There are a variety of metals with different uses and strengths.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● emerging technologies and their potential impact ● renewable and non-renewable natural resources ● Lumber selection ● Metal selection ● Fastener selection	● Identify and select various types of metals ● Identify methods of changing appropriate technology for various applications (size, social and cultural) ● Demonstrate the proper installation and application of common hardware items like nails, screws, bolts and rivets. ● Identify imperfections in lumber ● Select the appropriate material for the job application	● Curiosity ● Critical thinking

Academic Vocabulary:		
● Lumber	● Carbon steel	● Fastener
● Plain-sawn lumber	● Galvanized steel	● Threaded fastener
● Quarter-sawn lumber	● Nonferrous metal	● External thread
● Warpage	● Aluminum	● Internal thread
● Crown	● Copper	● United Thread Standard (UTS)
● Bow	● Magnesium	● Wood screw
● Twist	● Tensile strength	● Bolt
● Cup	● Machinablility	● Nut
● Metal	● Plastic	● Washer
● Alloy	● Thermoplastic	● Nonthreaded fastener
● Ferrous metal	● Thermoset plastic	● Nail
● Cast iron	● Rivet	● Wire brad
● Adhesive bonding	● pin	● staple

Assessments:

- Test
- Quizzes
- Participation
- Check points

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit talks about the differences between material and fasteners. Being able to determine the proper use and strength of the material or fastener being used is important. The ability to choose correctly requires critical thinking and problem solving. Students can use these skills in a variety of different courses when they are faced with a problem and have a plethora of choices to solve it with. They can determine the best solution through critical thinking and problem solving. These are skills that will be vital in life as well.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

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Introduction to Agriculture Engineering

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Unit 4

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		2 weeks

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Concrete and Masonry Construction
Unit Summary	Concrete and masonry construction is a necessary task for most agricultural business and facilities. An agricultural mechanic should have a thorough understanding of the chemical, mechanical, and physical properties of concrete and masonry materials. Concrete and masonry construction is used in agricultural applications for both new construction and repair work.

Unit Essential Questions:	**Key Understandings:**
• Think around you, what would your world and everyday life be without concrete?	• Concrete and mortar makeup • Concrete principles • Concrete calculation formula • Bill of materials

Focus Standards Addressed in the Unit

Standard Number	***Standard Description***
PST.04.03.06.b	Calculate volume for concrete projects
PST.04.03.06.a	Summarize the characteristics of the components found in concrete
PST.04.02.01.b	Analyze a project plan to prepare a bill of materials and an estimate of material costs.

Important Standards Addressed in the Unit:	
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.3.5.9-10.J.	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
CC.2.2.HS.D.8	Apply inverse operations to solve equations or formulas for a given variable.
CC.2.3.HS.A.7	Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.12	Explain volume formulas and use them to solve problems.
CC.2.3.HS.A.14	Apply geometric concepts to model and solve real world problems.

Misconceptions:	Proper Conceptions:
• Concrete is cured once it is hard. • Concrete and mortar are the same.	• Concrete takes 28 days to fully cure. • Concrete has aggregate in it and mortar does not.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Concrete calculations ● Composition of concrete and mortar ● Pouring and working concrete ● Cure time for concrete and mortar	● Read work order, instructions, formulas or processing charts ● Calculate volume needed for a project ● Lay block and brick ● Finish concrete ● Determine bill of material for project and all materials included	● Persistence

Academic Vocabulary:		
● Concrete ● Cement ● Aggregate ● Hydration ● Admixture ● Load-bearing capacity ● Groundwork ● Excavating ● Sloping ● Benching	● shoring ● foundation ● screeding ● joint control ● floating ● troweling ● wythe ● Masonry ● Trowel ● Jointer	● Brick hammer ● Brick set ● Line ● Brick ● Concrete masonry unit (CMU) ● Mortar ● Course ● Plasticity ● bond

Assessments:

- Test
- Quizzes
- Participation
- Check points
- projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- The masonry and concrete unit requires mathematical calculations to determine amounts and ratios. These calculations involve finding area and volumes. There is also a science connection when it comes to the chemical makeup of concrete and mortar. Students can use their knowledge of other subjects to help them relate the information to real life situations.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

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Unit 5

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		4-5 weeks

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Welding, cutting, and joining processes
Unit Summary	Cutting materials, welding materials, and joining materials together are important processes used in agriculture. These processes are used extensively for fabrication and repair of structures and agriculture equipment. The ability to perform cutting, welding, and other joining processes is required for agricultural mechanics.

Unit Essential Questions:	**Key Understandings:**
• How does welding apply to you and your everyday skills?	• Welding fundamentals • Oxyfuel welding and joining • Arc welding and plasma arc cutting

Focus Standards Addressed in the Unit:

Standard Number	***Standard Description***
PST.01.03.01.b	Analyze the situation and determine the best welding and cutting process to be used in metal fabrication.
PST.01.03.02.c	Construct and/or repair metal structures and equipment using metal fabrication procedures.

Important Standards Addressed in the Unit:	
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.3.5.9-10.J.	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
CC.2.3.HS.A.14	Apply geometric concepts to model and solve real world problems.
CC.2.3.HS.A.7	Apply trigonometric ratios to solve problems involving right triangles.

Misconceptions:	Proper Conceptions:
• When welding you touch the metal to metal to bond it.	• Welding is done through an electric arc between two metals that super heats the metal while adding a filler metal to the bead.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Identify and select various types of metals ● Identify and select various types of welding and cutting equipment including oxyacetylene and plasma arc. ● Adjust or set mechanical controls or components	● Select, adjust, operate and maintain oxy-fuel equipment with and without filler rods ● Identify and weld various joints to include fillet butt joint, vertical tee joint, double bevel joint and fillet tee joint. ● Use soldering equipment ● Fabricate a product by hand ● Repair sheet metal products ● Produce welds using stick and wire style welders.	● Critical thinking ● Problem solving

Academic Vocabulary:		
● Welding	● Filler metal	● Groove weld
● Fabricate	● Oxyfuel welding	● Shielded metal arc welding
● Oxyfuel welding	● Oxyacetylene welding	● Gas metal arc welding
● Arc welding	● Welding torch	● Short circuit transfer
● Resistance welding	● Neutral flame	● Globular transfer
● Weld bead	● Soldering	● Spray transfer
● Crater	● Capillary action	● Flux-cored arc welding
● Weld reinforcement	● Brazing	● Gas tungsten arc welding
● Root face	● Braze welding	● Plasma arc cutting
● Weld toe	● Weld joint	
● Root bead	● Weld type	
● Tack weld	● Fillet weld	

Assessments:

- Test
- Quizzes
- Participation
- Check points
- Projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- Students will need to follow step by step procedures in order produce an arc and lay down a bead. In order for the weld to be strong student will use problem solving skills to determine metal type, thickness and type of gas being used. From there they need to determine the wire speed and voltage needed to make a strong weld. From these students will gain problem solving skills and critical thinking when determining the best set up to weld. They will also gain hand eye coordination in order to produce a quality weld.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

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Introduction to Agriculture Engineering

Grades 9-12

Unit 6

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		3-4 weeks

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Agricultural Power and Machinery
Unit Summary	In this chapter students will introduced to the type of equipment and machinery that is used to perform work in an agricultural setting. Most machinery is internal combustion engines that require gasoline or diesel fuel. An agricultural mechanic must have an understanding of these principles as well as proper equipment maintenance practices. Due to depletion of fossil fuels, sustainable energy resources are being developed to help agricultural operations for the future.

Unit Essential Questions:	**Key Understandings:**
• What ramifications could there be if machinery and equipment are not used proper and not maintenance properly? Why?	• Work, power, and Torque principles • Agricultural equipment maintenance • Engines and mobile power equipment • Sustainable energy resources

Focus Standards Addressed in the Unit:

Standard Number	***Standard Description***
PST.02.01.02.a	Examine operators manuals to determine recommendations for servicing filtration systems and maintaining fluid levels on equipment, machinery and power units used in AFNR power, structural and technical systems.
PST.02.02.02.a	Examine and identify safety hazards associated with equipment, machinery and power units used in AFNR power, structural, and technical systems.
PST.02.01.01.a	Maintain the cleanliness and appearance of equipment, machinery, and power units used in AFNR power, structural and technical systems to assure proper functionality.
PST.02.02.01.c	Perform pre-operation inspections, start-up and shut-down procedures on equipment, machinery and power units as specified in owner's manual.
PST.02.02.02.c	Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.

Important Standards Addressed in the Unit:	
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.3.5.9-10.J.	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
CC.2.2.HS.D.8	Apply inverse operations to solve equations or formulas for a given variable.
CC.2.3.HS.A.12	Explain volume formulas and use them to solve problems.
CC.2.3.HS.A.14	Apply geometric concepts to model and solve real world problems.

Misconceptions:	Proper Conceptions:
• You can operate equipment on a farm if you are under 16 years of age.	• You may operate any piece of equipment on your families' owned farm no matter of age. To operate equipment on a different farm you must have a safe tractor certification or your driver's license.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Review operating and service manuals, and schedules; and, conduct procedures as needed ● safety inspections in industrial, manufacturing or repair settings ● Identify and describe agricultural equipment and their operations ● Identify renewable and non-renewable natural resources ● the historical development of agricultural power and systems technologies ● various gauges and testers used in agricultural power equipment ● Select, measure, use and calibrate testing devices and the machines ● disassembly and assembly procedures ● correct selection and use of agricultural machinery and equipment systems ● auxiliary systems including hydraulics, pneumatics and electronics ● troubleshooting procedures	● Locate and use a repair manual to diagnose malfunctions of various agricultural equipment ● Test a vehicle to determine installation, service or repair needed. ● Service vehicle with water, fuel or oil ● Conduct training in product use ● Provide customer service needs ● Identify the various types of land uses ● Identify global applications of agricultural power and systems technologies ● Identify emerging technologies and their potential impact ● Identify methods of changing appropriate technology for various applications ● Adjust or set mechanical controls or components ● Move or fit heavy objects ● Select, connect, engage and operate machinery and power units	● Ethical judgment ● Curiosity

• the parts and functions of specific energy systems to include electrical power, solar power, wind power, mechanical power and chemical/carbon-based power systems • Identify and investigate emerging technologies and their economic impact on energy systems • appropriate industry standards for energy systems	• Lubricate machinery, equipment or parts • Test electrical/electronic wiring, equipment, systems or fixtures • Repair or replace electrical wiring, circuits, fixtures or equipment	

Academic Vocabulary:

• Energy • Force • Horsepower • Pressure • Radiation • Torque • Work • Gear • Prime mover • Hydraulic system • Actuator • Pump • Hose • Cylinder • Pneumatic system • Generator • Converter • Solar energy • Photovoltaic system • Pyrolysis • Lubricant	• Bearing • Mechanical drive system • Belt drive • Belt • Slip • Flat belt • V-belt • Standard belt • Timing belt • Chain drive • Gear drive • Sustainable energy resources • Heat pump • Heat sink • Compressor • Wind turbine • Grid-connected wind energy system • Stand-alone wind energy system • Gasification • liquefaction	• Small engine • Gasoline engine • Diesel engine • Four-stroke cycle engine • Two-stroke cycle engine • Air-cooled engine • Liquid-cooled engine • Engine block • Crankshaft • Power take-off (PTO) • Piston • Connecting rod • Valve • Push rod • Camshaft • Turbocharger • Carburetor • Differential • Fermentation • Anaerobic digestion

Assessments:

- Test
- Quizzes
- Participation
- Check points

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit involves the use and maintenance of machinery and equipment in the agricultural setting. Students will learn to care and maintain the equipment and machinery to keep it in good running condition. This mindset and ability to do so will transition over to the way they care for their own personal things. Students will learn to have a respect for property and the property of others. Science will be introduced when talking about the alternative energy sources that are being developed.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

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Troy Summey

Introduction to Agriculture Engineering

Grades 9-12

Unit 7

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		2-3 weeks

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Project Design
Unit Summary	This unit will look at what goes into project planning. Project planning requires the ability to read and understand drawings, plans, prints and project specifications. Project planning also involves understanding estimates and bids for materials and processes. When planning for a project whether it is for a building or land conservation, surveying is a necessary step in the process.

Unit Essential Questions:	**Key Understandings:**
• Why is the project design the foundation of any build?	• Project Planning • Surveying

Focus Standards Addressed in the Unit:

Standard Number	***Standard Description***
PST.04.01.01.a	Interpret and explain the meaning of symbols used in sketches of agricultural structures.
PST.04.01.02.a	Read and interpret the parts and/or views of plans for agricultural structures.
PST.04.01.01.b	Apply scale measurement and dimension to develop sketches of agricultural structures.

Important Standards Addressed in the Unit:	
PST.04.02.01.c	Create a project cost estimate, including materials, labor and management for and AFNR structure.
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.3.5.9-10.J.	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
CC.2.3.HS.A.14	Apply geometric concepts to model and solve real world problems.
CC.2.1.HS.F.5	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.2.3.HS.A.13	Analyze relationships between two-dimensional and three-dimensional objects.

Misconceptions:	**Proper Conceptions:**

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● short, mid and long-term project plans. ● various types of land uses ● technical sketches ● pictorial drawing ● sectional drawing ● detail drawing ● assembly drawing ● plot plan ● floor plan ● plat of survey	● Read blueprints and schematics ● Read work order, instructions, formulas or processing charts ● Design and layout agricultural structures ● Design buildings or land for a customer ● Survey land ● Calculate land acreage	● Critical thinking

Academic Vocabulary:

- Sketch
- Multiview sketch
- Pictoral drawing
- Detail drawing
- Assembly drawings
- Sectional drawing
- Plot plan
- Floor plan
- Foundation plan
- Structural plan
- Utility plan
- Print
- Specification
- Construction specifications institute
- General contractor
- Subcontractor
- Estimating
- Building permit
- Authority having jurisdiction
- Bill of materials
- Request for proposal
- Surveying
- Public land survey
- Plat of survey
- Section
- Leveling rod
- Leveling
- Builders level
- Transit level
- Laser level
- Laser target
- Global positioning system
- Geographic information system

Assessments:

- Test
- Quizzes
- Participation
- Check points
- projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit has a strong connection to math and technical drawing. Students will use their math skills to determine things like slope and angles when surveying. They will also need math skills to scale down measurements for their drawings and layout work.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

Created By:

Troy Summey

Introduction to Agriculture Engineering

Grades 9-12

Unit 8

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		3 weeks

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Electrical and Plumbing systems
Unit Summary	In this unit students will be introduced to the principles of electricity and plumbing. They will design and wire up electrical circuits. They will also look at various aspects of plumbing including copper, pex and pvc piping.

Unit Essential Questions:	**Key Understandings:**
• How does knowing basic plumbing and electrical systems help you when you become a home owner?	• Plumbing safety • Plumbing systems • Electrical systems • Electrical safety • Electrical components • Plumbing and electrical codes

Focus Standards Addressed in the Unit:

Standard Number	***Standard Description***
PST.04.04.02.c	Plan and wire electrical circuits
PST.04.03.04.c	Install and/or repair pipes and plumbing equipment and fixtures in AFNR structures
PST.04.03.04.a	Compare and contrast the characteristics of materials used in plumbing and water systems.
PST.04.04.02.a	Distinguish electrical circuits and the components of each.

Important Standards Addressed in the Unit:	
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.3.5.9-10.J.	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
CC.2.2.HS.D.8	Apply inverse operations to solve equations or formulas for a given variable.
CC.2.1.HS.F.4	Use units as a way to understand problems and to guide the solution of multi-step problems
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Misconceptions:	Proper Conceptions:
• Voltage is what kills you when dealing with electricity.	• The amperage is what actually causes death with electricity. .01 amps can stop your heart.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Electrical codes ● Plumbing codes ● Ohm's law ● Irrigation systems ● Renewable and non-renewable natural resources. ● various types of land uses	● Use computers to enter, access, or retrieve data. ● Prepare a technical report ● Identify emerging technologies and their potential impact ● Identify methods of changing appropriate technology for various applications ● Demonstrate positive safety attitudes and responsibilities ● Describe regulations, safety and consumer protection ● Demonstrate accurate use of measurement devices and techniques for calculating measurement including the metric system ● Read blueprints and schematics ● Read work order, instructions, formulas or processing charts ● Identify the parts and functions of specific energy systems to include electrical power, solar power, wind power, mechanical power and chemical/carbon-based power systems	● Curiosity

	• Identify and investigate emerging technologies and their economic impact on energy systems • Explain appropriate industry standards for energy systems	

Academic Vocabulary:

• Plumbing system	• Runoff	• Circuit breaker
• Water main	• Aquifer	• Light-emitting diode
• Water distribution pipe	• Irrigation	• Electric motor
• Sanitary drainage system	• Soil erosion	• National Electric code
• Sewage	• Electricity	• Thermocouple
• Cleanout	• Energy	• Photovoltaic cell
• Potable water	• Voltage	• Disconnect switch
• Polyvinyl chloride	• DC voltage	• Overcurrent protective device
• Nominal pipe size	• AC voltage	• Thermal overload
• Black pipe	• Polarity	• Transformer
• Galvanized pipe	• Current	• General wiring
• Valve	• Ampere	• Service entrance
• Well pump	• Resistance	• Feeder conductor
• Pressure tank	• Power	• Branch circuit
• Septic tank	• Ohm's law	• Raceway
• Water cycle	• Generator	• Undergrounded conductor
• Soil moisture	• Conductor	• Wire marker
• Ground water	• Fuse	• Receptacle

Assessments:

- Test
- Quizzes
- Participation
- Check points
- projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit connects very well to science and math courses. Students will look at Ohm's law and have to do calculations to determine certain aspects of electricity. They will also learn about atoms, voltage, energy, etc. The connection to math and science will be strong in this unit. They will use their English skills to read plumbing and electrical codes that are required when building.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

Created By:

Troy Summey

Introduction to Agriculture Engineering

Grades 9-12

Unit 9

Course/Subject:	Grade:		Suggested Timeline:
Introduction to Agriculture Engineering	9-12		2-3 weeks

Grade Level Summary	This hand-on course of Introductory Agriculture Engineering is the prerequisite course for all future Agriculture Engineering courses. This course includes both the safety instruction and certification of equipment used in both metal and wood processes, drawing and designs and construction of various engineering projects used today with the Agricultural Industry.
Grade Level Units	9-12

Unit Title	Agricultural Structures and Maintenance
Unit Summary	In this unit students will learn about the many different type of structures made from a variety of materials are used in agricultural settings. The type of building method used and the type of structure depend on the farmstead plan and layout. Common agricultural structures include pole bars, out buildings, poultry barns and greenhouses. Specialized structures include hydroponic structures, which are built to utilize maximum energy efficiency.

Unit Essential Questions:	**Key Understandings:**
• What considerations must go in to planning a building? How do these considerations affect the building process?	• Building methods and structures • Building and energy efficiency • Fencing

Focus Standards Addressed in the Unit:

Standard Number	*Standard Description*
PST.04.03.01.c	Select materials for a project based upon an analysis of the project and the quality of the materials.

Important Standards Addressed in the Unit:	
PST.04.02.02.b	Assess and analyze local building code requirements for agricultural structures.
CC.1.2.9–10.L	Read and comprehend literary nonfiction and informational text on grade level, reading independently and proficiently
CC.1.2.9–10.J	Acquire and use accurately general academic and domain specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CC.2.1.HS.F.2	Apply properties of rational and irrational numbers to solve real world or mathematical problems
CC.3.5.9-10.J.	By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently
CC.3.6.9-10.B.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Misconceptions:	Proper Conceptions:
• Buildings can be placed any where you need them any time.	• There are local ordinances that mandate what you can and cannot do on your property.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● blueprints and schematics ● renewable and non-renewable natural resources ● various types of land uses ● building code ● framing systems ● hydroponic systems	● Read work order, instructions, formulas or processing charts ● Design a building for an application in agriculture using new technologies ● Develop short, mid and long-term project plans ● Identify emerging technologies and their potential impact ● Construct different structures ● Determine best structure for land use	● Curiosity ● Ethical behavior

Academic Vocabulary:

● Farmstead plan	● Conduction	● Cross fence
● Windbreak	● Convection	● Wire fence
● Footing	● Radiation	● Barbed wire
● Greenhouse	● Vapor barrier	● Electrical fence
● Hydroponic structure	● Perm rating	● Electric wire
● Aquaculture	● Thermal insulation	● Wire fabric fence
● Prefabricated building	● Weather stripping	● Rail fence
● Building science	● Fence	
● Heat transfer	● Perimeter fence	

Assessments:

- Test
- Quizzes
- Participation
- Check points
- Projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit looks at the building of structures in the agricultural setting. Students will use their math skills to measure and compute numbers.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Text book

Created By:

Troy Summey