

Perris Union High School District Course of Study

A. COURSE INFORMATION

Course Title: <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Agricultural Mechanics</div> <input type="checkbox"/> New <input checked="" type="checkbox"/> Revised	Subject Area: <input type="checkbox"/> Social Science <input type="checkbox"/> English <input type="checkbox"/> Mathematics <input checked="" type="checkbox"/> Laboratory Science <input type="checkbox"/> World Languages <input type="checkbox"/> Visual or Performing Arts <input type="checkbox"/> College Prep Elective <input type="checkbox"/> Other	Grade Level <input type="checkbox"/> MS <input type="checkbox"/> HS <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input checked="" type="checkbox"/> 10 <input checked="" type="checkbox"/> 11 <input checked="" type="checkbox"/> 12
Transcript Title/Abbreviation: <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">Ag. Mechanics</div> (To be assigned by Educational Services)	Is this classified as a Career Technical Education course? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Transcript Course Code/Number: <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">208241/208242</div> (To be assigned by Educational Services)	<p style="text-align: center;">Designated Subjects Career Technical Education Credential Required to teach this course: <i>subject: Agricultural or Natural Resource</i></p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <i>Single Subjects - Agriculture</i> <small>To be completed by Human Resources only.</small> </div>	
Required for Graduation: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> 5/11/17 </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> Signature Date </div>	
Meets UC/CSU Requirements? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Meets "Honors" Requirements? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Was this course <i>previously approved by UC for PUHSD?</i> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (Will be verified by Ed Services)	Unit Value/Length of Course: <input type="checkbox"/> 0.5 (half year or semester equivalent) <input checked="" type="checkbox"/> 1.0 (one year equivalent) <input type="checkbox"/> 2.0 (two year equivalent) <input type="checkbox"/> Other:	
Submitted by: Maggie Maratsos Site: Heritage High School Date: 2/27/17		
Approvals	Name/Signature	Date
Director of Curriculum & Instruction		3/28/17
Asst. Superintendent of Educational Services		4.13.17
Governing Board		

Prerequisite(s) (REQUIRED):

Plant and Animal Science
Algebra I

Corequisite(s) (REQUIRED):

None

Brief Course Description (REQUIRED):

Agriculture Mechanics is an academically challenging course that integrates mathematics, science, writing and mechanics. Specific units include: Using the Ag Mechanics Shop, Measurement, Project Planning, Electricity and Electronics, Plumbing Systems and Water Use, Concrete and Masonry, Arc Welding, Power Mechanics, and Careers. Students will focus on understanding theory of the preceding areas, as well as mastery of application of these theories. Students will exceed core academic knowledge and demonstrate critical thinking skills as they apply their knowledge to projects, real-life scenarios, and case studies. Students will perform advanced research in various fields. A variety of resources will be accessed (Internet, professional journals, books, and industry professionals) for the purpose of creating written and oral presentations that demonstrate students' knowledge and ability. Units covered in this course will build upon existing knowledge where applicable. End of unit projects will incorporate, at minimum, the knowledge acquired from at least one other previously covered unit. For example, students will learn about the properties of water in Unit 5, then utilize that understanding when they look at how water plays a role in the hydration of concrete in Unit 6. Throughout the course, students will be graded on participation in intracurricular FFA activities as well as the development and maintenance of an ongoing Supervised Agricultural Experience (SAE) program.

- Students conduct effective research utilizing professional journals and textual materials to understand theories, processes and procedures for each unit of study.
- Students will learn the skills that are essential for 21st century College and Careers.
- Students will demonstrate understanding of theory by communications such as research projects, oral and multimedia presentations, classroom practicum, and examinations.
- Students will apply knowledge, research and theory in response to given scenarios and provide written or oral evidence of their mastery of the subject through justification.
- Leadership skills such as public speaking, teamwork, and professionalism will be acquired through participation in FFA conferences, career development events, and chapter level FFA activities.
- Students will experience extensive experiential study and application of course content.
- Students will learn the importance of teamwork and the elements necessary to follow specific directions towards meeting a mutual goal within the context of work and research.
- Students will learn the importance of maintaining a practice of self-improvement for increasing and improving one's knowledge regarding new and innovative techniques and the latest research.

B. COURSE CONTENT

Course Purpose (REQUIRED):

What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Note: More specificity than a simple recitation of the State Standards is needed.

The purpose of this course is to equip students as a part of our Ag. Mechanics pathway. The goal is to build a foundation in the areas of applied mathematics, measurement, mechanics, electricity, plumbing, concrete, welding, and and repairs, as well as to help students build upon their skills in the area of science. It is also the hope of our department that students would like to further their education in mechanics and related fields to support the agricultural industry in feeding, clothing, housing, and protection of the natural resources of the world. This course would enhance the technical science knowledge and skills needed to carry out the applied science of mechanics, with several project-based learning experiences incorporated into the class throughout the year. Due to the emerging Common Core State Standards in writing and literacy, students will also be required to enhance their literacy skills in researching and reading comprehension of informational texts. Students will also express themselves through technical scientific writing as they complete research papers and presentations. Agriculture Mechanics is designed to provide students with the theories and principles related to engineering, through an agricultural lens. Emphasis is placed on tool operation, planning out projects, estimating, and acquiring technical skills. This course will also prepare those students planning on majoring in agricultural sciences at a 2-year and/or 4-year college or university.

Course Outline (REQUIRED):

Detailed description of topics covered. All historical knowledge is expected to be empirically based, give examples. Show examples of how the text is incorporated into the topics covered.

Unit 1 Using the Ag Mechanics Shop

Section Overview/Objectives: In this unit the students will learn to recognize major work areas and use safe procedures when working in an agricultural mechanics shop. Students will also learn to interpret safety colors and codes, protect the body against injury, and work safely in agricultural mechanics settings. Students will become aware of and recognize and reduce hazards in agricultural mechanics settings, and to react effectively in case of fire or other emergencies. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Information learned in Unit 1 will be utilized throughout the course.

Interactive Notebooks: Safety First - Students begin their notebooks with a section on safety in the shop. Cornell Note-taking format is taught. Specific tool safety is covered for each tool being introduced. Safety is an ongoing practice throughout the course with specific instruction and reinforcement to complement each unit. Students keep notes and directions regarding shop safety throughout the course. Using Interactive Notebooks, students track, annotate, and respond in writing to all materials covered in class. Notebooks facilitate the integration of mathematical and scientific concepts through daily writing, questioning and reflection. Notebooks also provide a platform for regular review of previous concepts and constructions and for written student-teacher interactions

Working With a Disability - After learning about major shop accidents and typical bodily injury locations, students will complete all class work for the period with a "disability". Students will draw from a can to determine which body part is injured (hand, arm, eyes, leg, etc.). Students will then be given a list of tasks to complete with their injury. This role play activity is meant to help educate students as to the challenges that can come from general shop injuries and to inform them of how easily most shop accidents can be avoided by wearing the appropriate attire and personal protective equipment. To culminate the activity, students will write about how accidents can be avoided by use of Personal Protective Equipment (PPE).

Equipment Check and Awareness of Environment - Four different scenarios will be set-up in the classroom shop. Each scenario will provide a work environment, tools, and project to be done. Students will observe the scene and read the script regarding the project to be completed. Students must determine if all safety materials are present and complete a tool/machine safety check. If items needed are missing from the scene students have to make recommendations about how the scene could be improved. Once complete the students will come up with a protocol to safely and effectively complete the scenarios task. Findings will be shared out with the class.

Critical Thinking: Logic Chains - Students develop their reasoning ability by first writing hypotheses and conclusions regarding shop and tool safety. They'll further develop their use of logic by creating logical-chains (both humorous and serious) as used in geometric proofs, describing the cause-and-effect of following the rule (or not following the rule) as preparation for their general shop safety and machine tool safety tests. One hundred percent accuracy is mandatory on all safety tests.

Technical Reading and Safety Precautions/Annotated Reading - Students are given an instruction manual for a piece of shop equipment. Students must read and annotate the instructional manual. Students will then create a "Quick Use" guide for someone who does not want to spend time reading the entire document. Attention must be paid to safety information as well as use. Upon completion of the Quick Use guide, students will compare their work to the actual Quick Use guide supplied with the equipment.

Unit 2 Measuring Up

Section Overview/Objectives: The students will learn how to select and use appropriate layout tools and procedures for woodworking and metalworking. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Concepts and practices learned in Unit 2 will be used throughout this course.

Use and Identification - Students will identify measurement and layout tools of the industry as well as their correct usage. Information obtained will be included in their interactive notebooks. Pictures of the tools along with a scenario detailing proper use will also be present.

A Fraction of an Inch - Students learn by teaching. For this assignment, students must make a story book that teaches a K-2 student how to read a ruler. The students' storybooks must show measurement to $1/16"$. Students must also demonstrate understanding of reducing of fractions. Story books will be graded based on a rubric format.

What is Scale? - In this activity students will understand that the term "SCALE" has a dual meaning in project design and drawings. Scale refers to the ratio of the linear size of the model to the size of the real object being modeled. A problem based worksheet is also provided to help students understand scale factors and define ratio of a model size relative to the actual object that the model represents. The Teacher will tap into prior knowledge in understanding that models and toys have different scales in relation to the real object being modeled. Students will understand that key parts to every scale drawing are the scale factor and the degree to which scale models has been reduced in size, compared to the original. Students will demonstrate their understanding of scale by completing a table showing real life sizes of various objects (10 items to be provided by teacher, 10 items to be selected by student) and then their scaled size in inches. Students must complete both $1/2"$ and $1/4"$ scale.

Supersize Me! - After studying scale factor, students choose an everyday object and enlarge it using a feasible scale factor of their choice and appropriate layout tools in the shop. Students use wood to design all or most components of the object but may supplement the object with other materials. Students apply their knowledge of ratio and proportion to create the enlarged objects. After designing the object, students analyze how increasing dimension affects surface area and volume. The outcome of this project is a new, larger object. Students understand scaling-up and scaling-down in theory and in practice.

Unit 3 Project Planning

Section Overview/Objectives: The students will learn how to use drawing techniques to create plans for personal projects. The students will be able to use and format a bill of materials and to make all calculations needed to develop a bill of materials. The student will be able to select and plan projects that develop the woodworking and metalworking skills needed in agricultural jobs. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Information obtained through Unit 3 will be utilized throughout this course as students learn theory, and then experience project development and construction.

Sketching and Drawing Projects adapted from Basic Elements of a Straight Line by Michael Cappetti CTE Online - Technical sketching is a necessary skill used by Architects, Engineers, & Contractors to communicate basic ideas in design and construction project work. This lesson starts with the very elementary practice of drawing straight lines without the aid of a straight edge. As we progress with our straight practice, the lesson will progress into geometric shapes such as triangles and also drawing lines at general angles such as 45 degrees. Proficiency in freehand technical sketching is communicating the idea without the use of words including elements of shading, perspective and detail. If the student sketches the classroom TV, does it look like a TV or a microwave? Proficiency is communicating! Try to understand that straight line practice in this lesson evolves into basic geometric shapes and then those basic straight line shapes are used to develop circles and arcs. Example - a square is used to develop a circle. Students will use these basic skills to complete a sketch and scaled drawing of a show box from their Agricultural Mechanics textbook.

Figuring a Bill of Materials adapted from Jake Dunn CTE Online - Students are given 3 project blueprints. Students must then complete a bill of materials for each project. Projects include a workbench, a welding table, and a farrowing crate. Students must correctly list all materials needed to complete each project in their bill of materials. Students will then need to compute the total materials cost for the project. Upon completion of materials cost, students will calculate estimated time needed to complete the project as well as cost of labor to determine an appropriate product cost to a consumer.

Engineering Your Future - Understanding Stress and Load - When engineers design an object or a structure, they must understand and consider the types of stress the object or structure will be under. They also consider the kind of load, or force that is going to cause stress. Students will be introduced to the three types of stress and three kinds of loads. Students will then look at common household items to determine the types of stress and loads the items are under. (Bicycle, basketball hoop, canoe, etc.)The students will complete a write-up on their findings. Students will then be given the following scenario and will use their knowledge to answer the questions. Students will also make recommendations to increase the ability of the bookcase to withstand stress and load. **Scenario:** Mary is building a bookcase using only wood and glue. What kinds of loads will be applied to the bookcase when it is in use? Will she be better off relying on the bookcases ability to withstanding shearing stress, tensile stress, or compression stress at the joints between the shelves and sides?

Physical and Mechanical Properties- Resistance, force, mass, color, melting point and ability to conduct heat are physical properties. Elasticity, hardness and stiffness are examples of mechanical properties. Both physical and mechanical properties combine differently in various materials. Students will predict and record answers to the following questions: Can a wood board of greater mass resist a greater static load than a board of lesser mass can resist? Can a wood board that is able to resist static load of a certain mass resist and impact of the same mass? Students will then develop and conduct a scientific experiment to test their hypothesis.

Project Plan, Design and Build – Students will come into the classroom where an SAE gallery of previous years Ag Mechanics students' projects are on display. The gallery is meant to provide students inspiration for their own SAE and project ideas. Students will develop a four year SAE plan (from CTE Online) that includes at least one of the projects in the Ag Mechanics gallery. Before starting construction, students create scale drawings for their projects, labeling all dimensions. From the scale drawings, students produce an orthographic projection. The scale drawings and orthographic projections are checked for accuracy before construction begins. Students then measure, layout and

build their project. Students calculate cost of materials used and then appropriate sale price. Costs associated with the construction of this project as well as time spent on work will be recorded in the students California FFA Record Book. *Students will add all additional projects created through the course into their California FFA Record Book. Information is to include material costs, time spent on project in and out of class, and sale price of project.*

Unit 4 Electricity & Electronics

Section Overview/Objectives: The students will learn to use principles of electricity and safety for planning simple wiring systems. Electricity is the major power source for stationary equipment in houses, farm, and ranch buildings, and agribusiness. It is the energy source commonly used for driving machinery, and for lighting, heating, and cooling. Some knowledge of electricity is essential for the safe use of electrical equipment. Understanding how to wire simple circuits and make minor electrical repairs is also useful. It is important to maintain electrical circuits and equipment properly to ensure their long life and safe operation. Major areas of instruction include; Electrical Principles and Wiring, Installing Branch Circuits, and Electronics in Agriculture. Knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test.

Use and Identification - Students will identify tools of the electrical and electronics industry as well as their correct usage. Information obtained will be included in their interactive notebooks. Pictures of the tools along with a scenario detailing proper use will also be present.

Introduction to Conductivity - A conductor is anything that allows an electrical current to flow easily through it. An electric current consists of moving particles called electrons or ions. Solids that conduct electricity have mobile electrons that are loosely held by their atoms. On the other hand, solids that obstruct or prevent the flow of electric current are called insulators or non-conductors. These particular solids have electrons that are closely bound to their atoms nucleus and are generally not free to move. In this activity students learn basic concepts about conductivity of electric current through solids and some liquids and solutions. Students will use a conductivity indicator to determine whether certain solid materials are conductors or insulators as well as some liquids. Student findings will be included in their class notebook as well as their original predictions on the items conductivity.

Exploring Energy Efficiency Lab Aids Kit- Energy comes in many forms, such as electricity, light, magnetism and heat. Regardless of their purpose, most appliances that use electricity transform some of the electrical energy into heat energy. If you've ever touched a glowing light bulb or one that just went out you know this – it's hot! When the purpose of the appliance is to produce something other than heat, the energy that becomes heat is considered "lost" or wasted. Efficiency is a measurement of how much energy is wasted. A fan with an efficiency of 90% converts 90% of the electricity used into kinetic energy of the moving fan blades and transforms 10% into wasted heat energy. In this activity, students will calculate how efficiently an incandescent flashlight bulb produces light energy. The greater the efficiency of a light bulb, the less heat it produces. Students will conduct an experiment to explore the energy efficiency of an incandescent light bulb. Students will submerge the bulb in water to determine the amount of "heat waste" that the bulb gives off.

Wire a Complete Circuit – Students will be given free selection of various supplies including various size batteries and light bulbs, as well as conductors and non - conductors. Students will work in teams to demonstrate their understanding of simple and parallel circuits. Students will diagram every attempt they make at creating a circuit. Once they are able to get their light bulb lit, they will explain why this method worked, and specify why each previous attempt failed. Students must use electrical terminology in their justification. Students will then use knowledge learned in lecture and lab to construct a simple circuit. Students must incorporate a duplex receptacle, switch, and fixture in their circuit. Assignment will be evaluated based on proper use of tools and supplies, safety of wire connections, and workability of the circuit.

Saving Energy - Energy is more than numbers on a utility bill; it is the foundation of everything we do. All of us use

energy every day – for transportation, cooking, heating and cooling rooms, manufacturing, lighting, water use, and entertainment. We rely on energy to make our lives comfortable, productive, and enjoyable. Sustaining this quality of life requires that we use our energy resources wisely. The careful management of resources includes reducing total energy use and using energy more efficiently. Students will complete a variety of tasks and projects related to identifying energy use and determining how energy can be saved. Examples are highlighted below.

- Electrical Nameplates – Students will use the electrical plates found on machinery in the Ag Mechanic’s shop to provide the amperage and volts of the machines. They will then use that information to calculate how many watts each machine uses. Once students have calculated watts, they will then determine the cost to operate the machine for the duration of a year.
- Environmental Impacts – Students will build upon the previous activity by determining the environmental impact of operating the shop equipment. The general rule is that on average every kilowatt hour of electricity produces 1.6 pounds of carbon dioxide.
- Energy Guide Labels / Comparing Appliances - Students will use Energy Guide labels from 2 similar machines. Their task is to choose the machine that is most economical considering purchase price as well as cost of operating the machine for expected life.

School Energy Audit - Students will conduct an energy audit of the school. Students will collect data on classroom light usage during the day, including bathrooms, offices, outside lights and the gym. They will look at light bulbs and calculate how much energy is being used per room. We will take a look at the school’s electricity bill, provided by the Energy Department at the district office. They will research to find the source of energy being provided to our school. And finally they will create a plan and share it with the administration and teachers on how we can all conserve our energy

Power from Hydroelectric Energy - *This* project will focus on increasing students’ knowledge of existing hydroelectric power plants in the U.S. Each student will research a different hydroelectric site and design a presentation containing a description of the site, how it generates energy, amount of power generated and how energy is stored and distributed. Students will also include environmental effects of creating dams and its potential impact on surrounding and downstream agriculture. In small groups, students will make presentations to each other.

Compare Alternative/Renewable Energies - *Students* will create a chart comparing all types of energies studied so far (solar, wind, geothermal, hydroelectric, hydrogen cell, natural gas, nuclear energy). They will collect information about the amount of energy created in a year, cost, environmental impacts, emissions, and waste. In groups students will then create an informational website which will include all the students’ information and present it to the class.

Math in Electricity - Students will use mathematical formulas throughout the electrical unit. Students will learn how to manipulate the formula $Watts = Volts \times Amperes$ to calculate watts, amperes and volts. Students will also calculate load capacity for various branch circuits. Students will also troubleshoot if a 40 ampere circuit has enough power to operate specified equipment/machinery.

Unit 5 Plumbing Systems & Water Use

Section Overview/Objectives: The students will learn to identify plumbing materials and perform basic plumbing procedures. Students will learn how to select, install, and maintain a soil irrigation system. Students will learn how to maintain and use fluid and robotic power in agricultural applications. Students will identify methods of water conservation. Major areas of instruction include Plumbing and Irrigation Technology. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test.

Use and Identification - Students will identify tools of the plumbing industry as well as their correct usage. Information obtained will be included in their interactive notebooks. Pictures of the tools along with a scenario

detailing proper use will also be present.

Phases of Matter: The Water Cycle Water Droplet Storybook -Students will write a creative story following a water molecule as it moves through the various phases of the water cycle and ends up falling through the tap of a home and into a glass of water. Throughout the assignment, students must demonstrate a thorough understanding of the atomic structure of a water molecule and how it behaves differently as a solid, liquid and gas by describing and illustrating these in their storyline. Students must demonstrate water molecule moving through all the stages of the water cycle (precipitation, evaporation, transpiration and condensation) and come full circle to demonstrate the understanding of a biogeochemical cycle. In addition, the requirement of the termination of the story allows students to gather background information of how humans have impacted the water cycle by including the components of how water is extracted from a collection site, moves through a water treatment facility, is transported via pipeline to a central water agency and distributed to homes. Students may also include the pumping of groundwater via a well and into the home. This exposes students to man- made systems that have been engineered to transport and purify water as they will learn more about in the units to follow.

Plumbing Exercise in Pipe Fitting - The purpose of the pipe fitting exercise is to obtain experience in assembling a watertight unit using different types of plumbing materials. Skills to learn include using various types of adaptors and fittings, cutting pipe materials to length, reaming and cleaning pipe ends, threading and making galvanized connections, making cemented plastic connections, soldering copper connections, and making polyethylene connections using clamps. Students will be provided blueprints, and must assemble the device according to the plan provided. Once the student has the device assembled, the project will be graded based on ability to follow plans, correct joining method of various materials, and ability of device to hold water without leaking.

Soil Percolation Experiment - Students will complete a soil percolation experiment to determine how quickly water can percolate from pure sand, a good potting soil, woodland soil, soil from the farm field, and soil of their choosing. Students will make predictions as to which sample will allow water to flow through the easiest and which sample will take the most time. Students will use this knowledge in choosing types of irrigation methods to be used on various soil types.

Irrigation Technology Plan - Students will be given 3 different scenarios and must design an irrigation plan that is appropriate. Students must choose type of irrigation used. Students will utilize skills learned in Units 2 & 3 to draw the irrigation layout for each scenario as well as create a list of needed supplies and materials. Students must also calculate cost of installation using current market prices for both parts and labor. Upon completion of the project, students must present one of the scenarios to the class and justify the irrigation method selected.

Unit 6 Concrete and Masonry

Section Overview/Objectives: Students will understand the large role that cement and concrete products play in everyday lives. Students will discuss and understand the difference between cement and concrete. Students will be able to explain how cement and concrete are used. Students will understand how cement is made. Students will be able to identify materials used to make concrete. Students will be able to explain how much energy is used to separate small or large particles. Students will learn about proportioning concrete mixes (Unit 2). Students will be able to identify various types of aggregate. Students will discuss why various sizes of aggregate are needed to create concrete. Students will know the chemistry of cement. Students will understand that concrete hydrates and the difference between hydration and drying. Students will be able to articulate the principle of conservation of mass. Students will demonstrate the ability to mix and place concrete and masonry materials. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test.

Use and Identification - Students will identify tools of the concrete and masonry industry as well as their correct usage. Information obtained will be included in their interactive notebooks. Pictures of the tools along with a scenario

detailing proper use will also be present.

What are the parts of Concrete – When given premixed concrete, students will make predictions regarding what components make concrete. Students will then use sieves to separate out the cement, sand, and gravel particles on the concrete mix. Students will weigh the initial mix, then weigh each component sifted out to determine ratios of sand, cement and gravel in their mix. Give each group of students a 250 ml beaker filled with dry concrete mix. Pour the mixture into the sieve with the largest sized openings with the succeeding smaller sizes below and the collection container at the bottom. Using short brisk motions of the sieves, time how long it takes for each sized particle to be separated. This activity will lead you to a working definition of concrete. The percent of each sized particle can be found by weighing each and comparing that to the total weight of the sample in the 250 ml beaker. Invite the students to identify each group of particles from the sieve. The finest particles contain the cement that makes up the bonding material holding the larger particles together when all of the four sized materials are mixed together with water. The next group of particles in the succeeding sieves are the various sized stones that make up the aggregates of the concrete mixture. The students will mix each of the five different sized particles with a small amount of water to see which of the particles actually set. Students will use this knowledge to determine which concrete mix sample, Sample A, Sample B, or Sample C would be best for their project use. (Teacher will have premixed the 3 samples before class, with Sample A containing a .5 : 3 : 6 ratio, Sample B containing a 1 : 2 : 3 ratio, and Sample C containing a 3 : 2 : 1 ratio.)

A further look at the components of Concrete - Paste, or mortar, in concrete is composed of Portland cement, water and entrapped air or purposely entrained air. Cement paste ordinarily constitutes about 25 to 40 percent of the total volume of concrete. Students can see proportioning in action by adding 3 to 5 times more water than required to cement and concrete mixes. This will demonstrate how many sizes of particles are needed in a concrete mix. Students will test two mixes: water mixed with concrete mix (cement, small and large aggregate), water, and water mixed with mortar (cement and small aggregate). Place one part concrete mix to five parts water in a jar. Shake the mixture and let it set for an hour or overnight. Remove larger sized aggregate from a dry concrete mix (or use a mortar mix) and pour one part of the finer mixture into a jar and add five parts water. Shake the contents and let it settle for an hour or overnight. Measure each layer to calculate the percentage of aggregate of each size in both mixes. Compare the two mixes to understand that different particle sizes play a role in quality concrete and see the difference between concrete and mortar.

A collection of aggregate - A list of aggregates is provided on the board. A classroom collection is helpful for students to see the varieties of concrete that are possible by varying the aggregates. Two different sized aggregates can be used to show that the total volume of space between aggregates does not change when the size of the aggregate changes. Measure the amount of water that it takes to fill two 1000 ml beakers, each containing a different size of aggregate. The volume of space between particles lessens only when the different sized aggregates are mixed. This can be shown rather dramatically if two different sizes of plastic beads are used. Review your experience with the aggregates from the mortar mix. The aggregates are of such a size to allow the most efficient surface contact between the cement paste and the different sizes of aggregates. The amount of cement paste used must be at minimum equal to the spaces in between the aggregate particles and a small amount more to make the concrete mixture relatively easy to move while pouring concrete and making the surface smooth. This is known as “workability.”

So you think concrete dries out - Students will learn about the hydration process by creating samples of concrete and weighing them before and after hydration. Students will make predictions on weight changes with their samples. They will see that the samples lose no weight to evaporation because of the chemical reaction between cement and water. The binding quality of Portland cement paste is due to the chemical reaction between the cement and water,

called hydration. Portland cement is not a simple chemical compound; it is a mixture of many compounds. The cement in concrete needs water to hydrate and harden. Even though the chemical reactions may be complete at the surface of the concrete, the chemical reactions at the interior of the concrete take much longer to complete. The strength of the concrete keeps growing as long as the chemical reactions continue. When water is added to cement, the chemical reaction called hydration takes place and contributes to the final concrete product. The calcium silicates contribute most to the strength of concrete. Tricalcium silicates are responsible for most of the early strength (first seven days). The original dicalcium silicate hydrates, which form more slowly, contribute to the strength of concrete at later stages. When concrete sets, its gross volume remains almost unchanged, but hardened concrete contains pores filled with water and air that have no strength. The strength is in the solid part of the paste, mostly in the calcium silicate hydrate and crystalline phases. Once students collect their final weights, they must write a written explanation as to why there were no changes in weight.

Math in Concrete - Students will calculate cubic yards of concrete required to pour various "jobs" to specification. Students will also calculate block needed to build walls and buildings of varying sizes.

Unit 7 Shielded Metal Arc Welding

Section Overview/Objectives: Students will learn to select electric arc welders, equipment, and other materials needed for welding in agricultural mechanics. Students will rely heavily upon the knowledge gained from Units 2 & 4 to fully understand the principles of the arc welding process. Students will use arc welding equipment and procedures in welding and cutting. Students will understand measurable attributes of objects and the units, systems, and processes of measurement (Unit 2). Students will recognize and apply mathematics in context, outside of mathematics (Unit 2). Students will understand and explain the interactions of energy and matter (Unit 4). Students will use grammatical and mechanical conventions in written compositions related to processes followed and materials used during projects (Unit 3). Students will understand the characteristics and components of the media allowing them to choose the proper presentation tools for the project and the audience. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Major areas of instruction include; Selecting and Using Arc Welding Equipment and Arc Welding Mild Steel.

Use and Identification - Students will identify tools of the metal and welding industry as well as their correct usage. Information obtained will be included in their interactive notebooks. Pictures of the tools along with a scenario detailing proper use will also be present.

Electrode Identification and Specifications - Students will make an information sheet in which they identify commonly used electrodes with the correct numbering system. Students must then determine the chemical makeup of the flux coating for each electrode and correlate their findings to the electrodes ability to protect a newly formed bead while it solidifies from a molten to a hardened state.

Let There Be Light - Students will strike and maintain an arc by building up a small boss on each center punch mark on coupon. After experimenting with various arc lengths in the welding booth, students will explain what happens when an arc is being maintained. Students must refer back to the electrical unit and use appropriate terminology in their explanation. This explanation should be included in their classroom notebook.

Defective Weld Conditions and Their Main Causes - Students will research common defects in welds. Students must then create an interactive chart that describes the weld defect, a visual representation of the defect, and explanation of the defect, a minimum of 3 reasons for the defect, and finally a way that the defect can be corrected in future welds.

Beads and More Beads - Students will learn to manipulate 2 variables of arc welding: arc length, travel angle, or travel speed. Students will run beads using 6013 welding rod. As students complete beads on weld coupons, they must adjust variables to appropriate and inappropriate values. Students will then evaluate their own and their peers beads. Students

must write justifications for why the beads run are either good or bad. Students must address the variables of arc length, travel angle, and travel speed in their written justifications.

Engineering Your Future - Testing Properties - Professionals who work with metals are concerned about the reliability of those metals. Welders and welding engineers for example, need to know how welding materials will perform under various stresses and loads. These characteristics are determined by the properties of the materials used and by the welding techniques used to join pieces. Welding technicians perform various tests on materials and on welding structures to discover this information. Three kinds of tests used by welding technicians are the impact test, the tensile test, and the guided bend test. Based on the information covered in class regarding testing properties, students will label various testing processes. Students will draw conclusions and infer the types of tests various products would have had to undergo. Items include industrial chain, automobile bumper, and file drawer handle. Students must explain their reasoning and thinking through the writing of an essay.

Non-Destructive Testing - Students will learn about the opportunities in the field of Non-Destructive Weld Testing from a Certified Weld Inspector (CWI) Level III. The CWI will come in and walk the students through the process that they would use in evaluation of a weld. The CWI will also discuss education and training required to enter the field.

Unit 8 Power Mechanics

Section Overview/Objectives: Students will learn to identify and explain the principles of operation and the systems of small gas engines. Students will be able to maintain and perform repairs on small engines. Students will explain how diesel engines work and explain how tractors are maintained. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Major areas of instruction include; Fundamentals of Small Engines, Small Engine Maintenance and Repair & Diesel Engines and Tractor Maintenance

Use and Identification - Students will identify tools of the industry as well as their correct usage. Information obtained will be included in their interactive notebooks. Pictures of the tools along with a scenario detailing proper use will also be present.

Background Research on Engines -Students write a research paper including history, development, an introductory exploration of the physics involved in the operation of the engine and how it has evolved to the current design stage, reporting orally to the full class their findings. Students research types of machines (device that transmits or modifies force or motion): simple, internal combustion, external combustion, turbine, electronic, hydraulics, and ones using alternative energy sources).

Theory Know Book - Students will choose an engine system to become a master of; they may choose the Compression System, the Fuel System, the Ignition System, the Cooling System or the Lubrication System. Students will then compile a Know Book detailing what comprises the system and how it works. Students will also identify and explain steps/processes involved in the service and/or troubleshooting of their chosen system. Upon completion of their book, students will be placed in groups by the instructor where each group has one master of each area. Students will become teachers of their peers in sharing information about each system. The groups will then work together to explain how all of the systems work together to complete the four stroke cycle of a four stroke engine.

It's Not Magic by Thomas Dougherty CTE Online - How does a carburetor work, is it physics or magic. The teacher will set-up a "carburetor" system using water bottles and tubing. Students will correlate their bottle set-up with that of an actual carburetor diagram. We then identify those parts on the different carburetors on their handouts as well as the idle circuit, main circuit and metering screws. When the pressure at the end of the tube is lowered, atmospheric pressure will push the fuel into the airstream. The teacher explains that on an actual engine the pressure drop is caused by the vacuum created by the piston travelling down with the intake valve open (the intake stroke). The teacher then

allows the students to fill water bottles, insert tubes and blow compressed air across the end of the tube with a blowgun. Students witness the water being sucked from the bottle and atomized in the air stream. By varying the diameter of the tubing and the amount of air being blown across, it they will simulate jetting and fuel flow.

Service and Maintenance - Students will develop a service and maintenance schedule for a tractor. Students must consider engine type and use in determining schedule.

Compression Ratios - The students will estimate the compression ratio of an engine from measurements, compare the estimate with the engine specifications, determine how the ratio would change if the cylinder head were milled, and consider the effect on other engine parameters.

Unit 9 Careers in Agricultural Mechanics

In this unit students will explore career opportunities, job applications, job descriptions, qualifications and requirements, education and training, and experience methodologies. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test.

Career Interest Profile and Reality Check - Students will use the California Career Zone website to assess their strengths and interests and how those things could correlate to a career. Upon completion of the survey, students will choose up to 4 careers that they were matched with and write a description of that career. AT least one career must be in the agriculture industry. Students will also go through the California Reality check in which they determine minimum monetary needs for their desired lifestyle. Students complete a proposed budget that contains information on housing, utilities, food, transportation, clothing, health care, personal needs, entertainment, miscellaneous costs, and savings. Students then compare the average pay of their desired career with the estimated budget to determine if their selected career will allow them to live the lifestyle they would like.

Career Research Paper & Presentation - Students choose one of the careers selected in the previous project complete a career plan. Students will first write a career research paper using MLA format. Information in the paper should include industry information, job description, qualifications, education needed, pay range, and projected demand for professionals in their chosen industry. Students will then create a career plan which includes the job description, interests, personal qualifications needed (things they need to know and things they need to know how to do), post-secondary education options, and professional associations. They should use information from www.cacareerzone.org first. And then fill in with information from at least two more sources, one professional association and one college. Students must cite each source used and the websites must be a .gov, .edu, and .org. Career presentations will be given to the class.

Job Applications - Students will be given a variety of job applications. Students will complete a minimum of 4 job applications in order to demonstrate proficiency in the correct completion of information and correct formatting.

Creating a Resume and Cover Letter - Students will create a cover letter and resume detailing the competencies and skills attained while enrolled in the Agricultural Mechanics course. Students will assume to be preparing this information for potential employment at a local fabrication, electrical, plumbing, concrete or power systems company.

The Interview - Students will research potential job interview questions and select 10. Students will then compose potential answers to the questions they selected. Students will then pair up and share their questions and answers with a partner. Discussion will be held on dos and don'ts of a job interview.

Mock Interviews - Students will go through mock interviews with industry professionals. Interviews will be held in front of the class. As classmates witness the interviews of their peers, they take notes in order to make recommendations on how the interview could have gone better and provide feedback on the aspects of the interview that went well. The industry professional will provide feedback to the class on the overall group performance.

Job Shadow -Students will select an agricultural occupation (or any occupation) that interests them, make contact with a local person currently employed in that area and arrange for a job shadow. The students will be given a job shadow packet that explains the assignment, provides questions to ask and an explanation of the assessment of the assignment.

Writing Assignments (REQUIRED):

Give examples of the writing assignments and the use of critical analysis within the writing assignments.

Job Applications - Students will be given a variety of job applications. Students will complete a minimum of 4 job applications in order to demonstrate proficiency in the correct completion of information and correct formatting.

Creating a Resume and Cover Letter - Students will create a cover letter and resume detailing the competencies and skills attained while enrolled in the Agricultural Mechanics course. Students will assume to be preparing this information for potential employment at a local fabrication, electrical, plumbing, concrete or power systems company.

Career Research Paper & Presentation - Students choose one of the careers selected in the previous project complete a career plan. Students will first write a career research paper using MLA format. Information in the paper should include industry information, job description, qualifications, education needed, pay range, and projected demand for professionals in their chosen industry. Students will then create a career plan which includes the job description, interests, personal qualifications needed (things they need to know and things they need to know how to do), post-secondary education options, and professional associations. They should use information from www.cacareerzone.org first. And then fill in with information from at least two more sources, one professional association and one college. Students must cite each source used and the websites must be a .gov, .edu, and .org. Career presentations will be given to the class.

Career Interest Profile and Reality Check - Students will use the California Career Zone website to assess their strengths and interests and how those things could correlate to a career. Upon completion of the survey, students will choose up to 4 careers that they were matched with and write a description of that career. AT least one career must be in the agriculture industry. Students will also go through the California Reality check in which they determine minimum monetary needs for their desired lifestyle. Students complete a proposed budget that contains information on housing, utilities, food, transportation, clothing, health care, personal needs, entertainment, miscellaneous costs, and savings. Students then compare the average pay of their desired career with the estimated budget to determine if their selected career will allow them to live the lifestyle they would like.

Background Research on Engines -Students write a research paper including history, development, an introductory exploration of the physics involved in the operation of the engine and how it has evolved to the current design stage, reporting orally to the full class their findings. Students research types of machines (device that transmits or modifies force or motion): simple, internal combustion, external combustion, turbine, electronic, hydraulics, and ones using alternative energy sources).

Interactive Notebooks: Safety First - Students begin their notebooks with a section on safety in the shop. Cornell Note-taking format is taught. Specific tool safety is covered for each tool being introduced. Safety is an ongoing practice throughout the course with specific instruction and reinforcement to complement each unit. Students keep notes and directions regarding shop safety throughout the course. Using Interactive Notebooks, students track, annotate, and respond in writing to all materials covered in class. Notebooks facilitate the integration of mathematical and scientific concepts through daily writing, questioning and reflection. Notebooks also provide a platform for regular review of previous concepts and constructions and for written student-teacher interactions

Technical Reading and Safety Precautions/Annotated Reading - Students are given an instruction manual for a piece of shop equipment. Students must read and annotate the instructional manual. Students will then create a "Quick Use" guide for someone who does not want to spend time reading the entire document. Attention must be paid to safety information as well as use. Upon completion of the Quick Use guide, students will compare their work to the actual Quick Use guide supplied with the equipment.

INSTRUCTIONAL MATERIALS (REQUIRED)

Textbook #1

Title: Agricultural Mechanics: Fundamentals and Applications

Edition: 6th Edition

Author: Ray V. Herren

ISBN-13: 978-1-4354-0097-9
ISBN-10: 1-4354-0097-6

Publisher: Delmar Cengage Learning

Publication Date: 2010

Usage:

- Primary Text
- Read in entirety or near

Textbook #2

Title:

Edition:

Author:

ISBN:

Publisher:

Publication Date:

Usage:

- Primary Text
- Read in entirety or near

Supplemental Instructional Materials *Please include online, and open source resources if any.*

Applied Mathematics

Published: 2010

Publisher: Goodheart-Wilcox

Author: Jesse Phagan

Math for Welders

Published: 2006

Publisher: Goodheart-Wilcox

Author: Nino Marion

Small Gas Engines

Published: 2000

Publisher: Goodheart-Wilcox

Author: Alfred Roth

Official FFA Manual

2014 - National FFA Organization

Concrete in the Classroom

Portland Cement Association - Online Resource

[http://www.cement.org/for-concrete-books-learning/education/concrete-in-the-classroom-\(grades-7-12\)](http://www.cement.org/for-concrete-books-learning/education/concrete-in-the-classroom-(grades-7-12))

CTE Online - Ag. Mechanics Model

California Department of Education - Online Resource

<http://www.cteonline.org/portal/default/Curriculum/Viewer/Curriculum?action=2&view=viewer&cmobjid=132916>

Conservation Connection Water and Energy Use in California

California Department of Water Resources - Online Resource

<http://www.water.ca.gov/education/>

Welding Connects Your World

Lincoln Electric - Online Resource

<http://www.lincolnelectric.com/en-us/education-center/training-materials/Pages/training-materials.aspx>

California Career Zone

California Career Resource Network - Online Resource

<http://www.cacareerzone.org/index>

Engineering Your Future

American Welding Society and Weld-Ed - Online Resource (2012)

<http://www.aws.org/educators/EngineeringYourFuture.pdf>

Agriculture Experience Tracker

Agriculture Experience Tracker - Online Resource

www.theaet.com

National FFA Organization

FFA Classroom Videos - Online Resource

<https://www.ffa.org/resources/educators/classroom-videos>

Estimated costs for classroom materials and supplies (REQUIRED). *Please describe in detail.*
If more space is needed than what is provided, please attach backup as applicable.

<p>Existing set of 36 (Already purchased; reference for future editions, should we need to purchase them)</p> <p>Cost for class set of textbooks: \$5,510.88 Class Set of 36 = \$141.74 each (Amazon) + Sales Tax of 8% = \$153.08 each Grand Total = \$5,510.88</p>	<p>Description of Additional Costs:</p> <p>ALL tools for the Agriculture Mech Lab Different types of ropes for each student Wire, sockets, receptacles, light fixtures Copper, PVC, steel, glue, flux, propane Lumber, nails, screws, bolts, sand paper Concrete</p>
<p>Additional yearly costs: Tools and Equipment: (\$10,000 / Years 1 & 2 set up) Rope/ knots lab- \$200 Electrical labs- \$1000 Plumping labs- \$1000 Wood projects/ labs- \$2000 Concrete projects- \$500 Field Trip- \$1000 Welding projects/ labs- \$2000</p>	
<p>Total cost per class set of instructional materials:</p>	<p>\$17,700</p>

<p>Key Assignments (REQUIRED):</p>
<p>Please provide a detailed description of the Key Assignments including tests, and quizzes, which should incorporate not only short answers but essay questions also. How do assignments incorporate topics? Include all major assessments that students will be required to complete</p>
<p>Interactive Notebooks: Safety First - Students begin their notebooks with a section on safety in the shop. Cornell Note-taking format is taught. Specific tool safety is covered for each tool being introduced. Safety is an ongoing practice throughout the course with specific instruction and reinforcement to complement each unit. Students keep notes and directions regarding shop safety throughout the course. Using Interactive Notebooks, students track, annotate, and respond in writing to all materials covered in class. Notebooks facilitate the integration of mathematical and scientific concepts through daily writing, questioning and reflection. Notebooks also provide a platform for regular review of previous concepts and constructions and for written student-teacher interactions</p> <p>Equipment Check and Awareness of Environment - Four different scenarios will be set-up in the classroom shop. Each scenario will provide a work environment, tools, and project to be done. Students will observe the scene and read the script regarding the project to be completed. Students must determine if all safety materials are present and complete a tool/machine safety check. If items needed are missing from the scene students have to make recommendations about how the scene could be improved. Once complete the students will come up with a protocol to safely and effectively complete the scenarios task. Findings will be shared out with the class.</p> <p>Figuring a Bill of Materials adapted from Jake Dunn CTE Online - Students are given 3 project blueprints. Students must then complete a bill of materials for each project. Projects include a workbench, a welding table, and a farrowing crate. Students must correctly list all materials needed to complete each project in their bill of materials. Students will then need to compute the total materials cost for the project. Upon completion of materials cost, students will calculate estimated time needed to complete the project as well as cost of labor to determine an appropriate product cost to a consumer.</p>

Project Plan, Design and Build – Students will come into the classroom where an SAE gallery of previous years Ag Mechanics students’ projects are on display. The gallery is meant to provide students inspiration for their own SAE and project ideas. Students will develop a four year SAE plan (from CTE Online) that includes at least one of the projects in the Ag Mechanics gallery. Before starting construction, students create scale drawings for their projects, labeling all dimensions. From the scale drawings, students produce an orthographic projection. The scale drawings and orthographic projections are checked for accuracy before construction begins. Students then measure, layout and build their project. Students calculate cost of materials used and then appropriate sale price. Costs associated with the construction of this project as well as time spent on work will be recorded in the students California FFA Record Book. *Students will add all additional projects created through the course into their California FFA Record Book. Information is to include material costs, time spent on project in and out of class, and sale price of project.*

Career Interest Profile and Reality Check - Students will use the California Career Zone website to assess their strengths and interests and how those things could correlate to a career. Upon completion of the survey, students will choose up to 4 careers that they were matched with and write a description of that career. AT least one career must be in the agriculture industry. Students will also go through the California Reality check in which they determine minimum monetary needs for their desired lifestyle. Students complete a proposed budget that contains information on housing, utilities, food, transportation, clothing, health care, personal needs, entertainment, miscellaneous costs, and savings. Students then compare the average pay of their desired career with the estimated budget to determine if their selected career will allow them to live the lifestyle they would like.

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Job Shadow -Students will select an agricultural occupation (or any occupation) that interests them, make contact with a local person currently employed in that area and arrange for a job shadow. The students will be given a job shadow packet that explains the assignment, provides questions to ask and an explanation of the assessment of the assignment.

Instructional Methods and/or Strategies (REQUIRED):

Please list specific instructional methods that will be use.

Direct Instruction Using PowerPoint Presentations, Cornell Notes, and Cloze Notes - Our students participate in mini-lectures to provide students with explicit instruction in key learning on a regular basis. These lectures are intended to preview learning material in advance of laboratory activities or to reinforce phenomenon following an exploratory experience. Students are always expected to take notes using either Cornell or Cloze formats and to be active, participants in the lecture.

Lab and Inquiry Activities - As previously described, laboratory activities will be project-based in nature, where in students will follow procedures, design projects of their own, and generate conclusions based on trial and error in their projects. Students will be graded on the quality of the end product of their unit projects. Being that Agricultural Mechanics is a heavily interactive course, the primary instructional strategy used to deliver curriculum are hands-on, performance-based methods, with experiential learning possibilities through the laboratory's events. This method of instruction allows students to practice the concepts (before putting together their unit projects) and see them in action, which research suggests leads to improved retention and ability for application. Another key instructional strategy used is Interactive Learning, which allows students to manipulate content in various ways and form cognitive anchors. For example, there are opportunities for students to engage in role-playing, discussion, and group projects. Every unit has at least one assignment that is Interactive Learning-based.

Research Papers - It is a thesis-driven exploration of thoughtful reading on a particular subject. The reading material may come from several sources. The purpose is to find and compile information, to participate in an exploration of the information, to make original observations, to show relationships between data gathered, and to make evaluations on a subject. Students will write papers on careers in Agricultural Mechanics that will reinforce many of the main concepts taught earlier in the year.

Small Groups - Frequently students work with peers or the teacher in small groups to reinforce concepts and to ensure mastery. Small groups may engage in academic discourse around a particularly challenging project or vexing application of a mechanics concept. Students who struggle on a particular projects or assignments may meet in a small group with the teacher while other students complete independent work. Small group instruction is a critical tool in differentiating curriculum for students.

Video Clips, Music, and Other Multimedia - To build students' understanding of how mechanics skills can be integrated in the world, our high school students leverage technology to see examples of projects that may be hard to replicate in the classroom or to provide experience in manipulating aspects of those projects. These multi-media tools provide students with strong personal connections and help to provide necessary scaffolds for student learning.

Student Discussions - At our high school, we believe that a key method of demonstrating competency and understanding of curriculum content is the ability to participate in academic conversations where students are able to discuss the content, use evidence to support their thinking and opinions, and to build on the conversations of others. Student discussions provide opportunities to assess student understanding of the scientific concepts they have learned.

Student Reflections - At the end of the year, students will complete a self-assessment to build internal understanding of their mastery of core concepts from the class and to build an individual plan for finding a career in agricultural mechanics.

Test Reflections and Corrections (All Standards) - Students will analyze their performance on all assessments.

They will identify mistakes, make corrections, and determine why they chose incorrect answers. They will also write a short reflection on how they can improve their performance in the future.

Assessment Methods and/or Tools (REQUIRED):

Please list different methods of assessments that will be used.

Student learning is continually assessed throughout the teaching of the units through the following:

Daily, Informative Assessments - These assessments are used on to gauge students mastery of discrete concepts taught during a specific class period. Informal assessments during class period (thumbs up/thumbs down, fist of five, using equity cards to question students, exit tickets, etc.) will be frequently used during every unit of study. Homework and problem sets will be regular assignments as well.

Unit Quizzes - These assessments are administered to gauge student mastery of integrated concepts after several days of instruction. These assessments are both formative and summative, providing early information regarding gaps in students' ability to integrate learning across discrete concepts and providing evidence of student mastery. There will be approximately 2-3 quizzes per unit of study. Assessments will include a mixture of comprehension and applied problem-solving depending on the content of instruction in the preceding weeks.

Research Papers - Research papers will be evaluated against the rubric set created by the teacher. Students must demonstrate their ability to research and translate their thoughts. Students must demonstrate an ability to read non-fictional material, as well as incorporate their own knowledge and data to make their papers stronger. There are several writing assignments throughout the school year to prepare students for the upcoming Common Core and Next Generation Science Standards.

Unit Exams and Projects - These assessments are administered to gauge students mastery of an entire unit of study for summative evaluation purposes. Unit exams include assessments of student mastery of vocabulary, ability to solve problems, or a specific skill set. Questions on exams (and all class projects) will include comprehension, applied problem-solving and integrative knowledge to assure that students understand the unit of study in all of its complexity.

Semester Final Exams - Twice a year, students will complete a cumulative exam which requires students to demonstrate mastery of core concepts learned in each unit. The semester 1 exam will address Units 1 through 5. The semester 2 exam will address Units 6 through 9.

Supervised Agricultural Experience - All agricultural students must have a Supervised Agricultural Experience (SAE) project. Students with an SAE learn by doing. With help from their agricultural teachers, students develop an SAE project based on one or more SAE categories:

- *Entrepreneurship* - Own and operate an agricultural business.
- *Placement* - Get a job or internship on a farm or ranch, at an agriculture-based business, or in a school or factory laboratory.
- *Research and Experimentation* - Plan and conduct a scientific experiment. (e.g. Determine whether the phases of the moon affect plant growth, or test and determine the efficacy of different welding methods.)
- *Exploratory* - Explore careers in agriculture by attending an agriculture career fair, or creating a report or

documentary on the work of a veterinarian.

Students must submit their California Agriculture Record Book as evidence of completion of their SAE requirement. Students' final grade will depend 10% on the completion of their SAE project. All students enrolled in an agricultural class must have a Supervised Agricultural Experience (SAE) project that relates to agriculture. Students can choose from a variety of projects and students get prior approval from the instructor to see if a project demonstrates quality, quantity, and relevance to agriculture.

FFA Participation - Since all students enrolled in an agricultural education course are considered FFA members, all students are required to attend 3 distinctly different FFA activities per semester. This participation is worth 10% of the semester grade. All students will be provided with a FFA calendar listing all FFA activities offered. Students can meet this requirement by participating in monthly meetings, joining a committee, attending a leadership conference, joining and completing in a judging team or being a chapter officer.

COURSE PACING GUIDE AND OBJECTIVES (REQUIRED)

Day(s)	Objective	Standard(s)	Chapter(s)	Reference
3 weeks	Using the Ag. Mechanics Shop: In this unit the students will learn to recognize major work areas and use safe procedures when working in an agricultural mechanics shop. Students will also learn to interpret safety colors and codes, protect the body against injury, and work safely in agricultural mechanics settings. Students will become aware of and recognize and reduce hazards in agricultural mechanics settings, and to react effectively in case of fire or other emergencies. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Information learned in Unit 1 will be utilized throughout the course.	Ag. CTE Standards B1.0-B1.2	Chapter 2	Agriculture Mechanics Fundamentals and Applications 6th Edition
2 weeks	Measuring Up: The students will learn how to select and use appropriate layout tools and procedures for woodworking and metalworking, as well as how to read rulers and measure items to scale. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Concepts and practices learned in Unit 2 will be used throughout this course.	Ag. CTE Standard B2.2, NGSS Standards HS-ETS1-2 and HS-ETS1-3, ELA Standard 11.12.3	Chapter 3	Agriculture Mechanics Fundamentals and Applications 6th Edition
2 weeks	Project Planning: The students will learn how to use drawing techniques to create plans for personal	Ag. CTE Standards	Chapter 5	Agriculture Mechanics

	<p>projects. The students will be able to use and format a bill of materials and to make all calculations needed to develop a bill of materials. The student will be able to select and plan projects that develop the woodworking and metalworking skills needed in agricultural jobs. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Information obtained through Unit 3 will be utilized throughout this course as students learn theory, and then experience project development and construction.</p>	<p>B12.2, B12.4-12.6, Common Core Math Standards G-MG 1 and 3, NGSS Standard 3-5-ETS1-1, ELA Standard 11.12.3</p>		<p>Fundamentals and Applications 6th Edition</p>
5 weeks	<p>Electricity and Electronics: The students will learn to use principles of electricity and safety for planning simple wiring systems. Electricity is the major power source for stationary equipment in houses, farm, and ranch buildings, and agribusiness. It is the energy source commonly used for driving machinery, and for lighting, heating, and cooling. Some knowledge of electricity is essential for the safe use of electrical equipment. Understanding how to wire simple circuits and make minor electrical repairs is also useful. It is important to maintain electrical circuits and equipment properly to ensure their long life and safe operation. Major areas of instruction include; Electrical Principles and Wiring, Installing Branch Circuits, and Electronics in Agriculture. Knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test.</p>	<p>Ag. CTE Standards B3.0-B3.6, NGSS Standards K-2-ETS1-2 and 3-5-ETS1-1, ELA Standard 11.12.3</p>	Chapter 11	<p>Agriculture Mechanics Fundamentals and Applications 6th Edition</p>
2 weeks	<p>Plumbing Systems and Water Use: The students will learn to identify plumbing materials and perform basic plumbing procedures. Students will learn how to select, install, and maintain a soil irrigation system. Students will learn how to maintain and use fluid and robotic power in agricultural applications. Students will identify methods of water conservation. Major areas of instruction include Plumbing and Irrigation Technology. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test.</p>	<p>Ag. CTE Standards B4.0-B4.4, B12.4 NGSS Standards K-2-ETS1-2, 3-5-ETS1-1, HS-ETS1-2, and HS-ETS1-3, ELA Standard 11.12.3</p>	Chapter 12	<p>Agriculture Mechanics Fundamentals and Applications 6th Edition</p>
2 weeks	<p>Concrete Masonry: Students will understand the large role that cement and concrete products play in everyday lives. Students will discuss and understand the difference between cement and concrete. Students will be able to explain how cement and</p>	<p>Ag. CTE Standards B6.0-B6.3, B12.5, NGSS</p>	Chapter 13	<p>Agriculture Mechanics Fundamentals and Applications</p>

	<p>concrete are used. Students will understand how cement is made. Students will be able to identify materials used to make concrete. Students will be able to explain how much energy is used to separate small or large particles. Students will learn about proportioning concrete mixes (Unit 2). Students will be able to identify various types of aggregate. Students will discuss why various sizes of aggregate are needed to create concrete. Students will know the chemistry of cement. Students will understand that concrete hydrates and the difference between hydration and drying. Students will be able to articulate the principle of conservation of mass. Students will demonstrate the ability to mix and place concrete and masonry materials. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test.</p>	<p>Standards K-2-ETS1-2, 3-5-ETS1-1, HS-ETS1-2, and HS-ETS1-3, ELA Standard 11.12.3</p>		<p>6th Edition</p>
<p>7 weeks</p>	<p>Shielded Metal Arc Welding: Students will learn to select electric arc welders, equipment, and other materials needed for welding in agricultural mechanics. Students will rely heavily upon the knowledge gained from Units 2 & 4 to fully understand the principles of the arc welding process. Students will use arc welding equipment and procedures in welding and cutting. Students will understand measurable attributes of objects and the units, systems, and processes of measurement (Unit 2). Students will recognize and apply mathematics in context, outside of mathematics (Unit 2). Students will understand and explain the interactions of energy and matter (Unit 4). Students will use grammatical and mechanical conventions in written compositions related to processes followed and materials used during projects (Unit 3). Students will understand the characteristics and components of the media allowing them to choose the proper presentation tools for the project and the audience. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Major areas of instruction include; Selecting and Using Arc Welding Equipment and Arc Welding Mild Steel.</p>	<p>Ag. CTE Standard B8.0-B8.4, B9.2, B9.3, B9.5, B9.7 NGSS Standards K-2-ETS1-2 and 3-5-ETS1-1, ELA Standard 11.12.3</p>	<p>Chapter 7 & 8</p>	<p>Agriculture Mechanics Fundamentals and Applications 6th Edition</p>
<p>3 weeks</p>	<p>Power Mechanics: Students will learn to identify and explain the principles of operation and the systems of small gas engines. Students will be able to maintain and perform repairs on small engines. Students will explain how diesel engines work and explain how tractors are maintained. This</p>	<p>Ag. CTE Standards B10.0-B10.6, B11.0-11.6, NGSS Standard</p>	<p>Chapter 4, 10</p>	<p>Agriculture Mechanics Fundamentals and Applications</p>

	knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test. Major areas of instruction include; Fundamentals of Small Engines, Small Engine Maintenance and Repair & Diesel Engines and Tractor Maintenance.	3-5-ETS1-1, ELA Standard 11.12.3		6th Edition
1 week	Careers in Agricultural Mechanics: In this unit students will explore career opportunities, job applications, job descriptions, qualifications and requirements, education and training, and experience methodologies. This knowledge will be demonstrated by completion of assignments, experiential learning, and a unit test.	Ag. CTE Anchor Standards 3.0-3.2, 3.4, 3.5, 3.9 ELA Standards 9-10.4 - 9.10.9, 11.12.2, 11.12.4	Chapter 1	Agriculture Mechanics Fundamentals and Applications 6th Edition
5 weeks	Woodworking: Students will learn to properly and safely use power woodworking equipment, as well as how to estimate a wood project by using applied mathematics (Unit 2). Students will also learn how to make repairs within wooden structures and use basic carpentry skills to create solutions for needs that must be met on our school farm.	Ag. CTE Standards B2.0-B2.4, Common Core Math Standards G-MG 1 and 3, NGSS Standards K-2-ETS1-2, 3-5-ETS1-1, HS-ETS1-2, and HS-ETS1-3, ELA Standard 11.12.3	Chapter 3 & 9	Agriculture Mechanics Fundamentals and Applications 6th Edition
2 weeks	Ropework: Knowing how to tie several different types of knots and how to work with rope is often an essential on-the-job task for people who work in agricultural careers, especially in agricultural mechanics. Students will learn and be able to demonstrate that they know how to properly tie and secure several different common knots in a practicum-type examination.	Ag. CTE Standard B.13		

C. HONORS COURSES ONLY	
Indicate how much this honors course is different from the standard course.	

D. BACKGROUND INFORMATION

Context for course (optional)

As we enter into the realm of “College and Career Readiness” in public education, the author of this course believes that a strong focus for our high school is to further develop pathways that support our local workforce. Riverside County alone is a very productive agricultural area, and is an important part of California’s \$44.7 billion agriculture sector. As recently as 2013, agriculture contributed \$2.77 billion to Riverside County’s economy, and provided over 15,000 jobs. Riverside County is especially prolific in the production of citrus crops, wine grapes, dry land crops (like alfalfa), poultry, dairy products, and ornamental nursery crops. These industries in this immediate area bring in multiple billions of dollars every year, and because of this, it seems fitting to have a class in which students can enroll and learn about the myriad of jobs available in agricultural machinery, construction, and repair, and practice skills that could make them valuable to employers that need such equipment. There are many different jobs available in this industry, and training students with knowledge and skills to take jobs in a constantly-growing industry is beneficial to the students as well as vital to the continuation of Riverside County’s agricultural industry.

History of Course Development (optional)

Our high school district prides itself on preparing students to meet the demands of the 21st century through the use of interactive, technology-filled curricula. Along with the new technological advances being put into place so that our students can compete in the workforce and be successful on the upcoming Smarter Balanced Common Core State Standards Assessment, our high school and district has a strong history in investing in Career Technical Education.

Students in our department have shown great interest in this Ag. Mechanics pathway. Our department has been teaching the principles of agricultural mechanics and equipment operation outside school time to enable students to compete statewide in Farm Power FFA contests. Students learn how to safely operate several different tractors, can troubleshoot equipment problems, and identify many different tools.

Many students wish to participate in the Ag. Mechanics pathway, but because of there is no class being offered that meets the UC requirements for an elective course, the agriculture department cannot meet the demands of many of those students at this time. This class will serve as the introductory course to our Ag. Mechanics Pathway. With the addition of this course, we seek to meet the needs of the college-bound student who has an interest in agricultural mechanics, while offering them a course that counts as a college-approved elective. This course has been created with the direction and leadership of the agriculture program at Norco High School, and mimics the rigor of a college level mechanics course.