Perris Union High School District
Course of Study

A. COURSE INFORMATION

Course Title:
(limited to 34 characters with spaces in Infinite Campus)

Ag Metals Fabrication

- [x] New
- [ ] Revised

If revised, the previous course name if there was a change

Transcript Course Code/Number:

(To be assigned by Educational Services if it's a new course)

CREDIT TYPE EARNED:	CALPADS CODE:
Elective - G	7122

Subject Area:

- [ ] Social Science
- [ ] English
- [ ] Mathematics
- [ ] Laboratory Science
- [ ] World Languages
- [ ] Visual or Performing Arts
- [x] College Prep Elective
- [ ] Other

Is this classified as a Career Technical Education course?

- [x] Yes
- [ ] No

If yes, which pathway does this course align to?
Pathway Name:

Agricultural Mechanics

CTE CDE Code: 101

Grade Level(s)

- [ ] MS
- [ ] HS
- [ ] 5
- [ ] 6
- [ ] 7
- [ ] 8
- [ ] 9
- [ ] 10
- [ ] 11
- [x] 12

Was this course *previously approved by UC* for PUHSD?

- [ ] Yes
- [x] No

(Will be verified by Ed Services)

If Yes, which A-G Requirement does this course meet?

Credential Required to teach this course:
To be completed by Human Resources only.

CTE: Agriculture and Natural Resources
Single Subject: Agriculture

Signature 12/12/23 Date

Submitted by: Mike VanWinkle
Site: PHS
Date: 12/8/23
Email: mike.vanwinkle@puhsd.org

Unit Value/Length of Course:

- [ ] 0.5 (half-year or semester equivalent)
- [x] 1.0 (one-year equivalent)
- [ ] 2.0 (two-year equivalent)
- [ ] Other:

Approvals	Name/Signature	Date
Director of Curriculum & Instruction		12/14/23
Asst. Superintendent of Educational Services		12/15/23
Governing Board		

Prerequisite(s) (REQUIRED):

Agricultural Science and Systems
Agricultural Mechanics
Agricultural Welding
OSHA 10 Certificate

Corequisite(s) (REQUIRED):

OSHA 30 Certification

Brief Course Description (REQUIRED):

This class will teach the student to fabricate and adapt various pieces of machinery by cutting, forming, and welding different types of metals. The purpose of this course is to continue students' study of the welding and fabrication industry and provide them an opportunity to develop a sound foundation in art and design elements through the metalworking process. The focus will be concentrated on pattern/repetition, balance/symmetry, shape, color, space, and texture. The methods used for this application will be executed through design phases and metalworking techniques such as cutting, layout, fitting, joining/welding, and finishing. Welding technology will also be emphasized while covering the topic of metallurgy, industry applications, and careers. Projects will include research into the historical and cultural connections of various metalworking and artistic processes. The goal is to expose the student to each of these areas of study while applying a method or technique through project-based learning.

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.

This is a hands-on course that is centered on students utilizing the skills acquired in the Agriculture Welding Pathway and applying them in conjunction with Fabrication concepts and techniques to design and fabricate a project on their own The main objective of this course is centered on teaching students the skills necessary to fabricate metal projects. We will review the welding processes taught in Agricultural Mechanics and Design (SMAW, GMAW, FCAW, GTAW, OAW, OFC, AND PAC). We will then review fabrication topics including Safety, Math for Welders, Plan Reading, Layout and Measurement, Machine Practices, Steel and Metallurgy, Bolting and Torque requirements, and Product Finishing. Included in this course is the creation of a project planning unit that incorporates: budgetary analysis, tool assessment, research plan and project drafting, and written proposal for projects. This course is a capstone course of the Agriculture Mechanics pathway.

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.

1. Lab Safety - Lab safety topics covered in this course are designed to build upon prior knowledge and practices of personal and group safety procedures. Safety topics revolve around lab practices related to the work industry including the safe setup, operation, and maintenance of fabrication equipment as well as acceptable industry-related procedures for project-based assignments in group and personal settings. Students will demonstrate these skills and traits throughout the year as they work in the lab on individual and group fabrication activities.
2. Power Tools in Agricultural Mechanics - Portable power tools and metalworking power equipment are vital components for industry-current, practical experience in the welding industry. Students learn basic elements of a variety of power tools and equipment in relationship to their function, adjustment, and operation. Students then take the basic concepts that they have learned and apply the skill for each tool or piece of equipment in a guided lab exercise that is designed to test their competency by producing a finished component related to that tool.;
3. Elements of Design and Project Planning, Measurements, and Layout - Developing a quality plan before starting any project is a necessary element of a quality fabricated product. Focusing on features such as accurate dimensions and angles through an accurate and scaled drawing, using correct welding and finishing symbols, developing a cut list for project components, and determining a bill of sale for the project allow the students to analyze their work before any cutting and welding take place. Design plans will include detailed sketches in the student notebook, CAD, material type and shape, process descriptions for creation, product finishing, cost analysis through a detailed bill of materials, and a detailed timeline for construction. This minimizes confusion and material waste, which helps maximize product quality as well as project value.
4. Introduction to Computer-Aided Drafting - Students will demonstrate awareness of practices, issues, and ethics of appropriation, fair use, copyright, open-source, and creative commons as they apply to creating designs. All computer-aided drafting programs are based on Cartesian coordinates. The evolution of the Cartesian coordinate system is taught as well as the related terminology such as; x-axis, y-axis, number line, positive direction, and negative direction. The concepts of the origin, absolute coordinates, relative coordinates (from the point you are currently at, not from the origin), and polar coordinates are taught in depth.
5. American Welding Society (AWS) Welding Certification
   Shielded Metal Arc Welding (SMAW) AND Flux Core Arc Welding (FCAW) in the vertical and overhead positions will prepare students for certification practices facilitated through the American Welding Society D1.1 Structural Steel Code. Students will complete lab assignments that demonstrate advanced welding skill levels by utilizing various welding electrodes and following the pre-qualified blueprint B-U2a from AWS section D1.1.3.
6. Presenting - Emphasis will be given to the development of critical viewing, meaning-making, and presentation skills. The elements of art and principles of design will be emphasized through the process of verbal and written critiques of personal work and the work of others. Students will learn various theories of art, develop curatorial teams that will select, based on criteria, and exhibit student work, set up a digital portfolio to document, share, and critique their work through the AET online record book system, write an artist statement, and use the language fo the arts, including the elements of art and principles of design, to effectively communicate their thoughts or position regarding works of art.
7. Small project construction - Small project construction will be used to help build each student's skill and ability using welding practices other than Gas Metal Arc Welding. Shielded Metal, Flux Core, and Gas Tungsten projects will focus student attention on processing specific characteristics using a supplied set of blueprints. The student's ability to correctly read and follow the directions from each blueprint along with developing tactical hands-on skills will play major roles in the quality of the project that they create.
8. Large project construction - Personal project construction allows each student an opportunity to take their developed idea and plan and turn it into a practical project-based experience. Students use the information that they developed during the project planning unit, as well as the skills and abilities developed with the hand power tools, and create the project of their choice. Metal and materials required for the project are funded by Perris High School.

Writing Assignments (REQUIRED): *Give examples of the writing assignments and the use of critical analysis within the writing assignments.*
Students will complete Reflection Journals that detail what they learn, the challenges they face, and the steps required to complete their small and large projects. Journals will follow the AXES format used in AVID classes.

INSTRUCTIONAL MATERIALS (REQUIRED)	
Textbook #1	
Title: Welding - Principles and Applications	Edition: Ninth
Author: Larry Jeffus	ISBN: 978-0-3573-7765-9
Publisher: Cengage	Publication Date: 2023
Usage: ☑ Primary Text ☐ Read in entirety or near	
Textbook #2	
Title: Agricultural Mechanics - Fundamentals and Applications	Edition: Sixth
Author: Ray V. Herren	ISBN: 978-1-4354-0097-9
Publisher: Delmar Cengage	Publication Date: 2010
Usage: ☑ Primary Text ☐ Read in entirety or near	
Supplemental Instructional Materials *Please include online, and open source resources if any.*	
www.theaet.com, www.ffa.org, http://www.cement.org/for-concrete-books-learning/education/concrete-in-the-classroom-(grades-7-12) http://www.cteonline.org/portal/default/Curriculum/Viewer/Curriculum?action=2&view=viewer&cmobjid=132916 http://www.lincolnelectric.com/en-us/education-center/training-materials/Pages/training-materials.aspx http://www.aws.org/educators/EngineeringYourFuture.pdf	
Estimated costs for classroom materials and supplies (REQUIRED). *Please describe in detail.* If more space is needed than what is provided, please attach a backup as applicable.	

Cost for a class set of textbooks: $5,871.24	Description of Additional Costs: Flat Bar, Square tubing, Round tubing, Sheet Metal, C Channel, Bolts, Nuts, Screws, Washers, Electrodes, Welding Wire, Decking, Hitch, Foot Jack, Chains, Light Kit, Tandem Fenders, Tandem Axles, Tires
Additional costs:$5,000	
Total cost per class set of instructional materials:	$ 10,871.24

Key Assignments (REQUIRED):

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

9. Lab Safety Plan - The lab safety plan is completed by each student in the class. The safety plan highlights traits that are required in the welding industry to help maintain a safe working environment by focusing on the specific characteristics, equipment, and district requirements within the lab at Perris High School. Highlights of this plan include personal protective equipment, ventilation, fire hazards and safety, arc welding safety, compressed gas safety, power equipment, power hand tools, accident reporting, and emergency procedures. Each student will identify the safe working conditions for each of these sub-topics as related to our specific welding environment and develop a plan that supports personal and group safety. Additionally, each student will highlight a specific topic by creating an informational poster that will be displayed in the lab and/or classroom to help support the development of safe working practices for all students. (This information can be graphically designed or with hand-drawn elements)
10. Practical Fabrication Techniques - Students complete a series of laboratory exercises that use a variety of lab tools and equipment to create components that are practical to fabrication techniques or standards Multiple tools are required for each of the three laboratory exercises. The first lab assignment requires students to cut a small section of square tubing using both the power band saw and the metal cut-off saw. Students have to set up each piece of machinery to the correct angle specified on the blueprint, as well as cut the metal to length. The second part of this assignment requires the students to use the ironworker to cut a section of flat steel to the specified blueprint dimensions. Each student then drills two holes into the flat steel using a portable power drill and a drill press. The square tubing and flat steel are then welded together after being squared correctly. Each student is required to self-evaluate their project using the laboratory exercise review sheet, checking for dimensional accuracies within the tolerances specified as well as the overall quality and appearance of their part.
    Each lab completion has a written lab report with the following elements: proposal, accuracy, location of specific elements taught, and overall evaluation of finishing quality.
    Included with the lab report process is a peer review of final projects and presented lab reports.
11. Project Plan - Every student must develop a project plan. This plan starts by focusing the student's attention on the types of projects that they are interested in through an interest survey. They are then responsible for locating similar ideas online and bringing at least three pictures back to class that they can use to help further develop their idea. A written description of their project with includes the name of the product, its purpose or use, types of materials required to construct, machinery or equipment used, or special operations that cannot be performed in the high school laboratory.
    The second phase of the project plan revolves around the sketches/drawings. Students are introduced to the concept of orthographic and isometric drawings by capturing a simple three-dimensional drawing on graph paper. In the next step, the students then work to capture their personal project idea on graph paper, focusing on scale, keeping the same edges on common planes, and correct dimensions. The next part is for each student to assign the correct welding symbols to their drawings. This includes the welding operation, location, and size of welds as well as any finishing symbols necessary for cutting, grinding, or sanding.

The third step in the project plan is for the students to take their drawings and develop a cut list for every material required for their project. This includes variations in dimensional sizes of materials such as tubing, flat steel, angle iron, etc. This list is utilized in two ways; 1) for the student to use during the actual fabrication of the project, and 2) to help develop a total length of each material. The students then take this list and develop a bill of materials by pricing the material that they have specified for their project. The plan will be fully documented as a Supervised Agricultural Experience project on the Agricultural Experience Tracker.

12. Practice certification procedures - through five different limited thickness certification samples, completing and passing the bend test for ⅜" limited thickness certification plate in the vertical up progression, and completing and passing the bend test requirements for the 1" unlimited thickness certification plate in the vertical up progression. These weld samples are all completed using a variety of sizes of E7018, E71T-1, and E71T-11 welding electrodes, and following quality control checkpoints throughout each weld.
13. Small projects - Students will follow a specified blueprint for each. The first project will be constructed using Shielded Metal Arc Welding, and both Flux Core Arc Welding gas and self-shielded. This assignment is a personalized coin bank and will require correct cutting of material to dimension, accurate component layout, and correct placement of weld type. Each student is required to self-evaluate their project using the laboratory exercise review sheet, checking for accuracies within the tolerances specified as well as the overall quality and appearance of their part. The second project will follow a similar format but will be constructed using stainless steel and assembled using Gas Tungsten Arc Welding.
14. CAD Project - Students will design a piece of artwork that could be used in the garden. The design must reflect the student's personality and the student must apply the principles and elements of design. The focus should be on line, shape, space, form, pattern, balance, proportion, and scale. Drawings are expected to be completed using correct layering, correct line types, and the correct orientation of views. Drawings are printed on ANSI "A3" sized paper and submitted for grading. A typical assignment would be to draw the 3 standard views (top, front, and side). Finalized drawings will be placed in the student portfolio. The .dwg files will be converted to .dxf and then used to generate a tool path for the CNC Plasma Table or the CNC Laser Engraver. The student will utilize one of those two technologies to generate their project from the selected material.
15. Large Project - These can range from smaller items such as coffee tables and stands to, larger items such as BBQs, tables, and trailers. During the construction of their project, each student is responsible for documenting using photographs, the progress being made at critical points of construction as well as their final project. These photos are then used to help enhance the student's marketing of their project as they create and develop buyer letters that get sent out to local supporters of Perris High School FFA. Students are required to present their project ideas, portfolio, and finalized project and are graded based upon industry standards and listening and speaking standards.
16. Student Portfolio and Presentation - Each student will create a portfolio to document the progress of their project. Students will examine existing functional art projects (lighting, furniture, etc.) in detail and provide a written analysis for the creation of their design plan. The Agricultural Experience Tracker(AET) will be used to track student progress. Students are required to present their project ideas, portfolio, and finalized project and are graded based on industry standards and speaking and listening standards. Students will establish a digital portfolio in AET of images of their artistic works and their construction along with their written explanations, and development plans. This will be an interactive forum for both formal and informal sharing and critiquing of student work.

Instructional Methods and/or Strategies (REQUIRED):

Please list specific instructional methods that will be used.

Direct Instruction
Student-Centered Learning
High-Tech Learning
Kinesthetic Learning

Personalized Learning
Art-based projects
Audio tutorials
Bulletin boards
Brainstorming
Classroom discussion
Class projects
Classroom video diary
Exhibits and displays

Assessment Methods and/or Tools (REQUIRED):

Please list different methods of assessments that will be used.

Self-assessments
Discussion board responses
Interviews
Reflections Journals
Projects
Portfolios
Semester Examinations
Unit Quizzes

COURSE PACING GUIDE AND OBJECTIVES (REQUIRED)				
Day(s)	**Objective**	**Standard(s)**	**Chapter(s)**	**Reference**
10	Lab safety topics covered in this course are designed to build upon prior knowledge and practices of personal and group safety procedures.	B01.0 Implement personal and group safety practices	2 - Safety in Welding	Welding - Principles and Applications
10	Students learn basic elements of a variety of power tools and equipment in relationship to their function, adjustment, and operation.	B2.0 Apply the principles of basic woodworking B5.0 Understand agricultural cold metal processes.	7 - Hand Tools, Fasteners, and Hardware; 17 - Metalworking with Power Machines	Agricultural Mechanics - Fundamentals and Applications
10	Design plans will include detailed sketches in	B9.0 Assimilate	18 - Sketching	Agricultural

	student notebook, CAD, material type and shape, process descriptions for creation, product finishing, cost analysis through a detailed bill of materials, and a detailed time line for construction.	metallurgy principles and fabrication techniques.	and Drawing Projects; 19 - Figuring a Bill of Materials 20 - Selecting, Planning, and Building a Project 41- Planning and Constructing Agricultural Structures	Mechanics - Fundamentals and Applications
10	Students will use their knowledge of technical sketching and multi-view projection and apply it to Computer Aided Drafting (CAD) software to create digital multi-view drawings with annotation.	B9.0 Assimilate metallurgy principles and fabrication techniques.	18 - Sketching and Drawing Projects	Agricultural Mechanics - Fundamentals and Applications
15	Shielded Metal Arc Welding (SMAW) AND Flux Core Arc Welding (FCAW) in the vertical and overhead positions will prepare students for certification practices facilitated through the American Welding Society D1.1 Structural Steel Code.	B8.0 Understand electric arc welding processes.	3 - Shielded Metal Arc Equipment, Setup, and Operation; 4 - Shielded Metal Arc Welding of Plate; 6 - Shielded Metal Arc Welding AWS SENSE Certification	Welding - Principles and Applications
10	The elements of art and principles of design will be emphasized through the process of verbal and written critiques of personal work and the work of others.	B1.0 Implement personal and group safety practices	2 - Career Options in Agricultural Mechanics	Agricultural Mechanics - Fundamentals and Applications
30	Small project construction will be used to help build each student's skill and ability using welding practices other than Gas Metal Arc Welding.	B7.0 Understand oxy-fule cutting and welding.	7 - Flame Cutting; 8 - Plasma Arc Cutting;	Welding - Principles and Applications
85	Personal project construction allows each student an opportunity to take their developed idea and plan and turn it into a practical project-based experience.	B12.0 Apply land measurement and construction techniques	2 - Career Options in Agricultural Mechanics	Agricultural Mechanics - Fundamentals and Applications

		commonly used in agriculture.		

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

D. BACKGROUND INFORMATION
Context for course (optional)
History of Course Development (optional)