Utah System of Higher Education
Civil Construction I
FY 2025 / 4 Credits (120 Clock-Hours)

Civil Construction I			
Institutions: Mountainland			
Certificate of Program Completion (Catalog Year: 2025, 4 Credits/120 Clock-Hours Required, CIP: 46.0415)			
Aligned (4 Credits/120 Clock-Hours)		**Credits**	**Clock-Hours**
TECI 1010	Civil Construction Fundamentals	4	120

June 6, 2024

Utah System of Higher Education
Civil Construction I
FY 2025 / 4 Credits (120 Clock-Hours)

PROGRAM DESCRIPTION

The Civil Construction I program will equip students with the essential knowledge and skills needed for a successful career in the construction industry. The program covers various aspects of civil construction, ensuring a well-rounded education for successful employment.

Objectives:

- Describe aspects of civil construction, including standard processes from bid to project hand-off.
- Identify the operation of various heavy equipment used in civil construction projects.
- Demonstrate integration of environmental considerations and sustainable practices.
- Demonstrate safety protocols.
- Demonstrate blueprint reading and measurement skills.
- Explain soil types and gradations.
- Describe essential elements of properly placing asphalt paving.
- Discuss importance of utilities management.

ALIGNED COURSE DESCRIPTIONS

Civil Construction Fundamentals **4 Credits/120 Clock-Hours**

This comprehensive course is designed to provide students with a foundational understanding of civil construction processes, equipment, safety protocols, and environmental considerations. From the initial bid to project hand-off, students will delve into the intricacies of construction blueprint reading, measurement techniques, and soil mechanics. Real-world application through site visits and a culminating capstone project will solidify their knowledge and skills for successful entry into the heavy civil construction industry.

Objectives:

- Explore the fundamental concepts and practices within the heavy civil construction industry.
- Identify the standard processes involved from project bidding to final hand-off.
- Identify the functions of various heavy equipment commonly used in construction projects.
- Explain the environmental factors affecting construction projects.
- Integrate sustainable practices into construction planning and execution.
- Demonstrate safety throughout all aspects of heavy civil construction.
- Interpret blueprints including recognizing symbols and measurements.
- Perform depth and slope calculations, read grade stakes, and review GPS data.
- Interpret and explain the basics of geotechnical reports.
- Identify sand and gravel aggregate types.
- Explain proctor and moisture requirements for soil compactions.
- Describe asphalt paving techniques, including sand and aggregate requirements.
- Follow safety protocols associated with asphalt paving.
- Perform practical site visits, focusing on earthwork, excavation, and material transportation.
- Demonstrate ability to maneuver heavy equipment utilizing heavy equipment simulators and emphasizing safety protocols.
- Demonstrate basic utility layout principles.
- Explain load requirements for utilities.
- Demonstrate trenching and excavation with a focus on safety.
- Prepare a comprehensive capstone project based on a module from prior learning, or

- alternatively, utilize on-the-job projects to meet capstone project requirements.

UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Farm Operations Technology
FY2025 / 18 Credits (540 Clock-Hours)

Farm Operations Technology			
Institutions: Snow			
Certificate of Program Completion (Catalog Year: 2025, 18 Credits/540 Clock-Hours Required, CIP: 010106)			
Aligned (6 Credits/180 Clock-Hours)		**Credits**	**Clock-Hours**
TEFO 1020	Farm Financial and Production Records	3	90
TEFO 2030	Farm Analysis	3	90
Non-Aligned (Electives)			
***Snow College* (12 Credits/360 Clock-Hours)**			
TEFO 1050	Farm Equipment Operations and Management	3	90
TEFO 2450	Agriculture Facilities Operations and Management	3	90
TEFO 2500	Irrigation Operations and Management	3	90
TEFO 2700	Farm Safety	3	90
TEFO 2830	Grazing and Forage Management	3	90

Utah System of Higher Education
Farm Operations Technology
FY2025 / 18 Credits (540 Clock-Hours)

PROGRAM DESCRIPTION

Farm Operations Technology prepares individuals to manage small to medium size farms, ranches, and similar enterprises. Includes instruction in business management including financial and production records financial statement preparation (basic accounting) business analysis, operational planning and budgeting, capitalization, applicable agricultural specialization of equipment, facilities, irrigation and grazing and forage, and government programs and regulations.

Objectives:

- Complete basic financial bookkeeping and production record keeping.
- Prepare financial statements, including Balance Sheets, Income State (Profit and Loss), and whole farm and enterprise analysis.
- Benchmark financial and production to guide strategic and applicable whole farm and enterprise planning.
- Perform operational planning and budgeting.
- Operate and manage farm equipment, livestock facilities, irrigation systems, and forage and grazing resources.
- Use applicable governmental programs and regulations.

ALIGNED COURSE DESCRIPTIONS

Farm Financial and Production Records **3 Credits/90 Clock-Hours**

Electronic financial and production record keeping is taught using actual farm financial and production records. Records are organized for whole farm as well as enterprise reporting. Balance sheets and an income statement is prepared for financial lending and reporting and for tax preparation.

Objectives:

- Accurate financial records.
- Input all financial transactions into accounting software.
- Keep accurate inventory for creating a complete and accurate beginning and ending balance sheets.
- Organize non-financial records (production and yields in pounds, tons, bushels, etc.) and enter into a production record keeping system (spreadsheet).
- Perform the appropriate calculations to determine all production costs as well as per unit cost of production.

Farm Analysis **3 Credits/90 Clock-Hours**

Using financial transactions including inventory along with all assets and all liabilities to prepare beginning and end of year balance sheets a fiscal year-end whole farm and enterprise analysis report is completed. Analysis of the year-end reports include benchmarking key financial ratios and cost of production matrixes to identify strengths and weaknesses in the business.

Objectives:

- Perform a whole farm business analysis and appropriate enterprise analysis of different farm operation through FINPACK software.
- Make accrual adjustments to cash Income Statement to arrive at an accrual adjusted Income Statement.

- Perform a complete business analysis which includes benchmarking key matrix variances.
- Do cash flow planning.
- Demonstrate the process of making sound farm management decisions.
- Implement a marketing plan for farm production.
- Utilize applicable government programs and adhere to government regulations.

NON-ALIGNED (ELECTIVE) COURSES DESCRIPTIONS

Snow College

Farm Equipment and Management **3 Credits/90 Clock-Hours**

Students are prepared to analyze factors that comprise safe machinery management and operation and the function of various machine mechanisms. Students learn machinery operation, maintenance, farm machine safety, procedures for diagnosing machinery problems, basic machine repair and processes for making machinery management decisions.

Objectives:

- Explain proper uses and selection of machines and pairing of machines for work tasks.
- Identify farm machines and machinery operations.
- Perform all maintenance and basic repair tasks.
- Perform economic analysis for machinery and pairing of machines to accomplish the work on a case study farm including fuel use and efficiency.

Ag Facilities Management **3 Credits/90 Clock-Hours**

This course trains students in the proper handling and design of livestock and veterinary facilities. This includes waste management and composting. Students will also define and create CAFO and AFO plans required by the State of Utah in large animal feeding operations.

Objectives:

- Define facility, environmental and waste management terms.
- Select and explain appropriate stockmanship, facility location, waste management, and environmental stewardship.
- Design solutions for new facilities and develop solutions for existing facilities that maintain or increase profitability.
- Evaluate the effectiveness of different facility locations and waste management practices.
- Create a CAFO and AFO waste management plan for a livestock operation.

Irrigation Management **3 Credits/90 Clock-Hours**

This course trains students in various technologies used in sprinkler irrigation systems. Emphasis is on pivot maintenance and operation of Variable Rate (VR) (precision) irrigation to meet production goals. Various crop's water requirements, water resources, application methods, types and selection of irrigation equipment, application time and rates, irrigation wells principles and operations, maintenance and repair, costs and returns are covered.

Objectives:

- Explain the effects of irrigation on crop production.
- Use soil moisture probes to probe soil moisture as part of developing an irrigation plan.
- Identify components utilized to make and implement Variable Rate Irrigation plans.

Farm Safety — 3 Credits/90 Clock-Hours

Farm Safety course provides training in working with and around machinery, chemicals, electricity, hydraulics, ATV, and farm animals. Students will acquire knowledge and demonstrate skills to safely work on a farm ranch.

Objectives:

- Demonstrate safe operation of major farm equipment including: understanding of equipment instrumentation and controls, towing, backing, equipment attachment safety, and common machine hazards and highway safety.
- Complete requirements for Utah Pesticide Applicators License which includes testing on, Pesticide and chemical safety, formulations, labeling and preventing pesticide poisoning.
- Compete assessments on working safely around and with electricity, overhead line clearance, main switches, breaker boxes, and fuses.
- Demonstrate safe handling and working around livestock, horses, cattle, zoonosis (diseases which can be transmitted from animals to humans) and animal waste-manure pits.
- Complete Utah OHV Education Course in safe operation of ATV's, and OHV's, including protective equipment, operation on paved or gravel roads and on slopes, and legal ATV operation on public roads and property.
- Demonstrate taking care of yourself, personal protection equipment, ergonomics, stress, rest, heatstroke, drugs and medications, and first aid.

Forage and Grazing Management — 3 Credits/90 Clock-Hours

Students learn to analyze the factors that comprise forage growth, forage nutrients, soil health, total forage production, grazing, monitoring of forage growth and grazing management. Students will know the various growing and grazing practices and their role in the economics of a livestock operation, resource sustainability, approaches and procedures for making management decisions, and develop a grazing plan.

Objectives:

- Identify forages, life cycles, development stages and harvesting principles.
- Use aerial imagery for forage growth and health, and livestock utilization.
- Identify monitoring techniques including trend line analysis and aerial imagery for forage resource viability.
- Develop and implement grazing and harvesting techniques to best utilize soil, forage, and livestock resources.
- Explain the economics associated with resource improvements and forage use and management.
- Explain plant physiology and function, and soil, plant, and animal health principles.

UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Heavy Equipment Technology
FY2025 / 10 Credits (300 Clock-Hours)

Heavy Equipment Technology

Institutions: Tooele

Certificate of Program Completion (Catalog Year: 2025, 10 Credits/300 Clock-Hours Required, CIP: 47.0302)

Aligned (10 Credits/300 Clock-Hours)		Credits	Clock-Hours
TEDT 2000	Hydraulic Systems	2	60
TEDT 2010	Advanced Components	1	30
TEDT 2020	Advanced Schematics	1	30
TEDT 2030	Advanced Troubleshooting	1	30
TEDT 2040	Track Repair	1	30
TEDT 2050	Basic Welding for Advanced Equipment	3	90
TEDT 2060	Thermo and Plasma Cutting	1	30

Utah System of Higher Education
Heavy Equipment Technology
FY2025 / 10 Credits (300 Clock-Hours)

PROGRAM DESCRIPTION

The Heavy Equipment Technology program provides students an advanced understanding of equipment repairs with an emphasis on the diagnostic and repair skills needed to thrive as a heavy equipment technician. Students will show advanced understanding in hydraulic systems, understand schematics, gain troubleshooting skills, show competency in welding, cutting, and track repairs.

Objectives:

- Interpret hydraulic schematics.
- Diagnose and repair system used on heavy equipment.
- Troubleshoot and repair hydraulic systems.
- Perform on-site repairs, such as welding and track repair.

ALIGNED COURSE DESCRIPTIONS

Hydraulic Systems — 2 Credits/60 Clock-Hours

The Hydraulic Systems course identifies and describes the purposes of various components used in hydraulic systems and provides understanding of hydraulic system operation to safely maintain and repair equipment and systems.

Objectives:

- Classify system components.
- Interpret basic schematics.
- Describe how a hydraulic system operates.
- Demonstrate safe working practices.

Advanced Components — 1 Credit/30 Clock-Hours

The Advanced Components teaches students to identify and understand utilization of advanced hydraulic systems for use in a wider variety of applications. Students will be able to recognize and repair individual components and understand the various applications and the reason for their use.

Objectives:

- Identify a wide variety of hydraulic system components.
- Demonstrate the applications of components within the hydraulic system.
- Repair components of the hydraulic system.

Advanced Schematics — 1 Credit/30 Clock-Hours

The Advanced Schematics course teaches students to recognize hydraulic symbols and become proficient at recognizing, reading, and following intricate hydraulic schematics and recognize the components.

Objectives:

- Describe the meaning of hydraulic symbols.
- Interpret intricate hydraulic schematics.
- Identify symbols and recognize the component.
- Explain hydraulic systems and how they work.

Advanced Troubleshooting — 1 Credit/30 Clock-Hours

In the Advanced Troubleshooting course, students will understand, inspect, and diagnose hydraulic systems and complete safe and correct repair procedures. Failure analysis comprehension will enhance repair practices and procedures.

Objectives:

- Identify correct diagnosis of hydraulic systems.
- Illustrate failure analysis.
- Apply safe and correct repair techniques of hydraulic systems.
- Inspect hydraulic systems.

Track Repair — 1 Credit/30 Clock-Hours

In this course, students will learn how to maintain track systems, as well as how they can fail, and how to repair them.

Objectives:

- Diagnose cause of a failed track.
- Explain track drive systems.
- Repair failed track.

Basic Welding — 3 Credits/90 Clock-Hours

In this course, students will learn basic welding processes and techniques that may be needed to complete repairs including different types of welding for proper repairs, and when to utilize them.

Objectives:

- Perform basic welding skills.
- Perform welds that will hold up under heavy use.
- Determine the best type of welding for the various repairs needed.

Thermo and Plasma Cutting — 1 Credit/30 Clock-Hours

In this course, students will expand on the torch cutting previously learned. They will learn different processes and techniques to help with more precise cutting for specific repairs, and when to use them for safe and proper repairs.

Objectives:

- Use a plasma cutter.
- Demonstrate proper thermo cutting techniques.
- Conduct proper cutting techniques.

Utah System of Higher Education
Pipe Welding
FY2025 / 26 Credits (780 Clock-Hours)

Pipe Welding

Institutions: Mountainland

Certificate of Program Completion (Catalog Year: 2025, 26 Credits/780 Clock-Hours Required, CIP: 48.0508)

Core (26 Credits/780 Clock-Hours)		Credits	Clock-Hours
TEWT 2315	Gas Metal Arc Welding (GMAW)/Flux Cored Arc Welding (FCAW) – Pre-Pipe	2	60
TEWT 2320	Gas Metal Arc Welding (GMAW) – Pipe	4	120
TEWT 2420	Flux Cored Arc Welding (FCAW) – Pipe	4	120
TEWT 2115	Shielded Metal Arc Welding (SMAW) – Pre-Pipe	4	120
TEWT 2120	Shielded Metal Arc Welding (SMAW) – Pipe	4	120
TEWT 2215	Gas Tungsten Arc Welding (GTAW) – Pre-Pipe	4	120
TEWT 2220	Gas Tungsten Arc Welding (GTAW) – Pipe	4	120

Utah System of Higher Education
Pipe Welding
FY2025 / 26 Credits (780 Clock-Hours)

PROGRAM DESCRIPTION

In the Pipe Welding program, students will learn advanced pipe welding principles. Students will learn the day-to-day tasks of the advanced welder from lectures, hands-on application, and practice to be prepared to pass advanced ASME Section IX, AWS D1.1, and API 1104 welding certifications. Through instruction and hands-on practice, students will learn and test their skills for the following advanced welding processes: GMAW, FCAW, SMAW, and GTAW.

Objectives:

- Describe processes using proper terminology used in the pipe welding industry.
- Differentiate between processes and techniques used to weld on pipe versus traditional welding.
- Use advanced welding tools and equipment need for pipe welding.
- Pass the welding qualification tests.

ALIGNED COURSE DESCRIPTIONS

Gas Metal Arc Welding (GMAW)/Flux Cored Arc Welding (FCAW) – Pre-Pipe

2 Credits/60 Clock-Hours

The GMAW/FCAW Pre-Pipe course will help students become familiar with the techniques, positions, and joints used for welding pipe as used in structural, pipeline, and pressure vessel applications. This course will teach the students specialized techniques used for pipe welding application such as open root “v” grooves, using GMAW RMD, GMAW Pulse, and FCAW gas shield. FCAW may be waived if students have achieved the D1.1 structural steel certification in these processes.

Objectives:

- Classify specialized techniques used for pipe welding applications.
- Interpret open root “V” grooves, using GMAW RMD, GMAW Pulse and FCAW gas shield.
- Demonstrate a tack using the feathering technique on ⅜”-½” plate with different size root opening.
- Perform a weld on ⅜”-½” plate in the following positions with GMAW RMD root, GMAW pulsed fill and cover pass, GMAW RMD root, FCAW gas shield fill and cover pass: 2G, 3G and 4G.

Gas Metal Arc Welding (GMAW) – Pipe

4 Credits/120 Clock-Hours

The GMAW Pipe course will help students become familiar with the techniques, positions and joints used for welding pipe using the GMAW process and used in structural, pipeline and pressure vessel applications.

Objectives:

- Demonstrate proper technique to weld 6” schedule 80 pipe in the 2G, 5G and 6G positions.
- Show use of RMD for the root passes, pulsed and short circuit transfers for the fill and cover passes.
- Identify techniques necessary to qualify for the American Welding Society’s (AWS) D1.1 Structural Steel Code as well as the American Society of Mechanical Engineer’s (ASME) Section IX pressure vessel and piping code.
- Demonstrate weld on 6” schedule 80 pipe in the following positions with RMD for the root and short circuit transfer and the root and pulsed for the fill and cover pass: 2G, 5G 6G.
- Qualify in the ASME IX 6G Pipe- RMD Root, Pulse Fill & Cap.

Flux Cored Arc Welding (FCAW – Pipe **4 Credits/120 Clock-Hours**

The FCAW Pipe course is designed to help students become familiar with the techniques, positions and joints used on welding pipe using the FCAW process as used in structural, pipeline and pressure vessel applications.

Objectives:

- Demonstrate proper technique to weld 6" schedule 80 pipe in the 2G, 5G and 6G positions.
- Use a backing ring and RMD for the root passes, gas shielded and self-shielded for the fill and cover passes.
- Identify techniques necessary to qualify for the American Welding Society's (AWS) D1.1 Structural Steel Code as well as the American Society of Mechanical Engineer's (ASME) Section IX pressure vessel and piping code.
- Demonstrate weld on 6" schedule 80 pipe in the following positions with RMD for root and gas, root and self-shield and backing ring and gas shielded for the root, fill and cover pass: 2G, 5G and 6G.
- Qualify in ASME IX 6G Pipe- GMAW RMD Root, FCAW Fill & Cap.
- Qualify in AWS D1.1 6G Pipe- FCAW Dual Shield with backing ring.

Shielded Metal Arc Welding (SMAW) – Pre-Pipe **4 Credits/120 Clock-Hours**

The SMAW Pre-Pipe course will help students become familiar with the techniques, positions and joints used for welding pipe as used in structural pipeline and pressure vessel applications. This course will instruct students in the specialized techniques used for pipe welding applications such as open root "V" grooves, using SMAW E7018 and SMAW E6010. Students with D1.1 structural steel certification in this process may waive this course. SMAW may be waived if a student has a D1.1 structural steel certification in this process.

Objectives:

- Classify specialized techniques used for pipe welding applications.
- Interpret open root "V" grooves, using SMAW E7018 and SMAW E6010.
- Demonstrate a tack using the feathering technique on ⅜"-½" plate with different size root opening.
- Demonstrate a weld on ⅜"-½" plate in the following positions with E6010 Electrodes for the root, E7018 electrodes for the fill and cover pass: 2G, 3G and 4G.
- Demonstrate a weld on ⅜"-½" plate in the following positions with E6010 Electrodes for the root, first fill (hot pass) and E7018 Electrode for the last fill and cover pass: 2G, 3G and 4G.

Shielded Metal Arc Welding (SMAW) – Pipe **4 Credits/120 Clock-Hours**

The SMAW Pipe course will continue to help students with advanced techniques, positions and joints used for welding pipe using the SMAW process as used in structural, pipeline and pressure vessel applications. The course will teach students proper techniques to weld pipe in the 2G, 5G and 6G positions. Students will master the techniques necessary to qualify for the American Welding Society (AWS) D1.1 Structural Steel Code as well as the American Society of Mechanical Engineers (ASME) Section IX pressure vessel and piping code.

Objectives:

- Demonstrate technique to weld 6" schedule 80 pipe with E6010 Electrodes for the root, fill and cover passes: 2G, 5G downhill and 6G downhill positions.

- Demonstrate technique to weld 6” schedule 80 pipe in the following positions with E6010 electrodes for the root and E7018 electrodes for the fill and cover passes: 2G, 5G uphill and 6G uphill.
- Demonstrate technique to weld on 6” schedule 80 pipe with E6010 electrodes for the root and hot pass, and E7018 electrodes for the remaining fill and cover passes: 2G 5G downhill root and hot pass and uphill fill and cover pass.
- Prepared to take the AWS D1.1 6G pipe qualification test.
- Prepared to take the API 1104 6G pipe qualification test.

Gas Tungsten Arc Welding (GTAW) – Pre-Pipe **4 Credits/120 Clock-Hours**

The GTAW pre-pipe welding course will help students become familiar with the techniques, positions, and joints used for welding pipe as used in structural, pipeline, and pressure vessel applications. This course will teach students specialized techniques used for pipe welding applications such as open root “V” grooves, using GTAW “walking the cup” technique. GTAW may be waived if the student has a D1.1 structural steel certification in this process.

Objectives:

- Tack using the feathering technique on ⅜”- ½” plate with different sizing root opening.
- Demonstrate weld on ⅜” to ½” plate in the following positions, with the GTAW process: “walking the cup” for the root, first fill and E7018 for the fill and cover pass: 2G, 3G and 4G.
- Demonstrate weld on ⅜” to ½” plate in the following positions with the GTAW process: “walking the cup” for the root, fill and cover pass: 2G, 3G and 4G.

Gas Metal Arc Welding (GMAW) – Pipe **4 Credits/120 Clock-Hours**

The GTAW pipe welding course will help students become familiar with the techniques, positions, and joints used for welding pipe as used in structural, pipeline, and pressure vessel applications. This course will teach students how to make root and fill passes using the GTAW process by “walking the cup” of the GTAW torch. Students will also prepare to qualify for the American Welding Society's (AWS) D1.1 structural steel code and the American Society of Mechanical Engineers (ASME) Section IX pressure vessel and piping code.

Objectives:

- Demonstrate weld on 6” schedule 80 pipe in the following positions, using the GTAW process for the root, fill and cover passes: 2G, 5G and 6G.
- Demonstrate weld on 6” schedule 80 pipe in the following positions with the GTAW process for the root and hot pass and E7018 for the fill and cover pass: 2G, 5G and 6G.
- Prepare for the ASME Section IX 6G Pipe qualification - GTAW root and hot pass, E7018 fill and cap.

Utah System of Higher Education
Power Equipment and Motorcycle Technology
FY2025 / 24 Credits (720 Clock-Hours)

Power Equipment and Motorcycle Technology			
Institutions: Salt Lake			
Certificate of Program Completion (Catalog Year: 2025, 24 Credits/720 Clock-Hours Required, CIP: 47.0611)			
Aligned (24 Credits/720 Clock-Hours)		**Credits**	**Clock-Hours**
TEPM 1010	Power Equipment Engine Fundamentals and Repair	6	180
TEPM 1020	Advanced Power Equipment Engine Systems and Repair	6	180
TEPM 1030	Power Equipment and Motorcycle Fundamentals	6	180
TEPM 1040	Motorcycle, Drive, Suspension and Steering Systems	6	180

Utah System of Higher Education
Power Equipment and Motorcycle Technology
FY2025 / 24 Credits (720 Clock-Hours)

PROGRAM DESCRIPTION

This certificate is designed to give students the opportunity to learn all aspects of power equipment and motorcycle engines and their various manufacturers. Instruction will include theory and lab where students will diagnose engine performance problems and repair them.

Objectives:

- Recognize and maintain safety in the shop as well as personal work habits.
- Identify, use and differentiate between correct tools, including precision measuring instruments. Identify and use appropriate fasteners, gaskets, sealants, as well as torque and torque sequence.
- Identify, describe and summarize the structure of an atom, the fundamentals of electricity and electrical circuits, the relationship of magnetism with electricity, and electrical system construction and operation, ignition, lubrication and cooling systems.
- Identify, describe and summarize the principles of operation for two and four-stroke engines, and be able to differentiate the strengths of each style engine.
- Identify, describe and summarize the purpose of all engine components and their functions, as well as measuring engine performance including horsepower, toque, and energy output.
- Describe the benefits of carburetion and fuel injection systems along with their various components, as well as differentiate between different types of fuels.
- Identify, describe and summarize the purpose of transmission and other drive systems.

ALIGNED COURSE DESCRIPTIONS

Power Equipment Engine Fundamentals and Repair **6 Credits/180 Clock-Hours**

Designed to give experience from all aspects of small engines. Theory and operation are reviewed from the textbook during class, and students will service and repair engines and machine systems during lab. Students complete work on two- and/or four-cycle engines. Safe shop practices and professional behavior will be emphasized. This course is part 1 of 2.

Objectives:

- Recognize and maintain safety in the shop as well as personal work habits.
- Identify different choices between fasteners, including sealants and gaskets. Demonstrate the appropriate use, torque and tightening sequence for the situation.
- Describe and summarize the structure of an atom, fundamentals of electricity and electrical circuits, relationship of magnetism with electricity, and electrical component construction and operation.
- Describe and summarize the principles of two and four-stroke engines and be able to identify the strengths of each.
- Identify the differences between carburetion and fuel injection systems, understanding the components and operating principles of each system.
- Identify and use correct tools, including precision measuring instruments.

Advanced Power Equipment Engine Systems and Repair **6 Credits/180 Clock-Hours**

Second half of PE Engine Fundamentals. Designed to give experience from all aspects of small engines. Theory and operation are reviewed from the textbook during class, and students will service and repair engines and machine systems during lab. Students complete work on two- and/or four-cycle engines. Safe shop practices and professional behavior will be emphasized. This course is part 2 of 2.

Objectives:

- Recognize and perform effective troubleshooting and preventative maintenance.
- Inspect and summarize the purpose of all engine components in the fuel, ignition, electrical, crankcase, cylinder camshaft and valve systems.
- Describe and perform effective engine reassembly and break-in process.
- Identify the purpose and become familiar with engines in their varieties of applications.

Power Equipment and Motorcycle Fundamentals **6 Credits/180 Clock-Hours**

Program consisting of safety, proper use of hand and shop tools, fasteners, fuels, lubricants and coolants, 2 and 4 stroke motorcycle engine theory, proper use of reference materials, and physical principles of engine operation. Course includes electrical theory and repair of chassis harnesses, charging, starting, ignition and lighting systems, and fuel systems. This course is part 1 of 2.

Objectives:

- Recognize and maintain safety in the shop as well as personal work habits.
- Identify, use and differentiate choices between correct tools, including precision measuring instruments, understanding the appropriate tool for the situation.
- Identify, describe and summarize the structure of an atom, the fundamentals of electricity and electrical circuits, the relationship of magnetism with electricity, and electrical component construction and operation.

Motorcycle, Drive, Suspension & Steering Systems **6 Credits/180 Clock-Hours**

A comprehensive program consisting of safety, proper use of hand and shop tools, motorcycle drive systems, steering and suspension, proper use of reference materials, and physical principles of engine and drive train operation. Course includes transmission and final drives, clutches, suspension, and braking systems from various manufacturers. This course is part 2 of 2.

Objectives:

- Recognize and maintain safety in the shop as well as personal work habits.
- Identify the purpose of suspension and steering system components including wheels, tires, brakes, shocks, forks, springs, and alignments.
- Describe and summarize the purpose of all transmission components including clutches and Final drive systems.
- Demonstrate the ability to perform routine maintenance and troubleshooting steps in diagnosing issues.

UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Veterinary Assisting
FY2025 / 14 Credits 480 Clock-Hours)

Veterinary Assisting

Institutions: Bridgerland, Snow

Certificate of Program Completion (Catalog Year: 2025, 14 Credits/480 Clock-Hours Required, CIP: 01.8301)

Aligned (14 Credits/480 Clock-Hours)		**Credits**	**Clock-Hours**
TEVA 1011	Introduction to Veterinary Assisting	2	60
TEVA 1301	Vet Assisting Applications	1	30
TEVA 1401	Emergency Critical Care/End of Life	1	30
TEVA 1501	Clinical Procedures I	1	30
TEVA 1502	Clinical Procedures II	2	60
TEVA 1503	Clinical Procedures III	3	90
TEVA 2999	Clinical Externship	4	180
Non-Aligned (Electives)			
Bridgerland Technical College (4 Credits/120 Clock-Hours)			
TEVA 1111	Patient Management and Nutrition	3	90
TEVA 1201	Vet Assist Clinical Sciences	1	30
Snow College (8 Credits/240 Clock-Hours)			
TEVA 1010	Introduction to Animal Science	4	120
TEMA 1080	Medical Terminology	2	60
TEVA 2200	Anatomy and Physiology of Domestic Animals	4	120
TEVA 2400	Animal Nutrition Management	4	120

Utah System of Higher Education
Veterinary Assisting
FY2025 / 14 Credits 480 Clock-Hours)

PROGRAM DESCRIPTION

Veterinary Assisting provides students with hands-on training to develop skills to work as support staff in veterinary clinics, shelters, or other animal-based entities. Under the supervision of veterinarians, laboratory animal specialists, and zoological professionals, students learn to provide patient management, care, and clinical procedures assistance as well as owner communication. Including instruction in animal handling and restraint, nursing care, animal health and nutrition, clinical pathology, radiology, anesthesiology, lab procedures, blood collection, IV catheterization, surgical assisting, dental cleanings, vaccines, physical exams, office administration skills, and applicable standards and regulations.

Objectives:

- Safely and successfully restrain and work with a variety of small and large animals.
- Perform nursing care, laboratory procedures, dental cleanings, IV catheterization, vaccinations, and physical exams.
- Perform routine lab procedures including blood collection, fecals, and infection control.
- Use appropriate veterinary terminology and pharmacology in communication with faculty, veterinarians, and other veterinary staff.
- Provide various species care and demonstrate appropriate interactions with clients and the animals' owners.

ALIGNED COURSE DESCRIPTIONS

Introduction to Veterinary Assisting **2 Credits/60 Clock-Hours**

The Introduction to Veterinary Assistant course provides a fundamental understanding of what a veterinarian assistant/pre-technician professional does to assist a veterinarian and other veterinary staff while helping animals in need. It covers the ethical and legal issues applicable to veterinary care. The course introduces students to the safety techniques needed when interacting with animals of various species. Students who complete this course can communicate with other professionals using correct terminology and are familiar with basic safety techniques necessary for their future work in a clinical setting.

Objectives:

- Define career expectations of veterinarian assistants.
- Identify ethical and legal issues in veterinary care.
- Perform proper safety techniques.
- Practice animal management and human interaction.
- Use correct medical terminology as it pertains to animal sciences.

Vet Assisting Applications **1 Credit/30 Clock-Hours**

The Vet Assisting Applications course provides students with the foundational knowledge needed to participate in labs in the Clinical Procedures courses. The course covers various animal organs and systems necessary to be ready to perform and assist in procedures related to anatomy and physiology. Much of the course is also dedicated to introducing students to the techniques and equipment they will use in their other courses. Students who complete this course have a strong theoretical foundation of anatomy and clinical procedures upon which they can build in their clinical courses.

Objectives:

- identify anatomy and physiology of various species.
- Identify surgical instruments and explain uses.
- Explain various surgical techniques.
- Explain various pain management techniques.
- Explain proper drug administration routes and techniques.

Emergency Critical Care/End of Life **1 Credit/30 Clock-Hours**

The Emergency Critical Care/End of Life course introduces students to a variety of animals treated in a veterinarian practice. Knowledge from all previous courses is pulled together to prepare students for work in a professional setting. The course covers how to recognize and address the physical condition of an animal and begin the care process for a sick or wounded patient. Students who complete this course will have enough knowledge and practical experience to be ready for a position as a skilled assistant.

Objectives:

- Identify emergency situations and required critical care.
- Identify emergency situations and best practices for various injuries.
- Demonstrate procedures for fluid therapy and blood transfusions.
- Demonstrate knowledge of animal dentistry.
- Identify breeds and classifications of various species.
- Explain proper care and general grooming procedures.

Clinical Procedures I **1 Credit/30 Clock-Hours**

The Clinical Procedures I course provides students with an introduction to basic skills in the classroom and practice laboratory. Students use the theoretical knowledge they have acquired in other courses in a practical setting to manage care for various species with uncomplicated conditions. The course covers additional safety measures and equipment use procedures. Students must also receive their CPR certification. Students who complete this course are able to apply their knowledge of basic anatomy and physiology in a clinical setting.

Objectives:

- Safely handle needles and syringes.
- Demonstrate proper animal restraint techniques.
- Perform hands-on dissections of various animal body parts.
- Demonstrate techniques for evaluating animal reproductive health.
- Practice proper tube feeding techniques.
- Identify common pharmaceuticals used with animal treatment.
- Demonstrate animal hardware use (collars, carriers, muzzles, bags, gloves, etc).
- Practice proper radiology positioning and safe handling of lead gear.

Clinical Procedures II **2 Credits/60 Clock-Hours**

The Clinical Procedures II course builds on skills learned in Clinical Procedures I that are required in the animal care process in the classroom and practice laboratory. Students are given more opportunities to demonstrate proper animal restraint techniques and collect various types of samples from their patients. Students also gain experience in preparing patients for surgery. Students who complete this course are prepared for many of the day-to-day responsibilities of a skilled assistant.

Objectives:

- Demonstrate advanced animal restraint techniques.
- Demonstrate appropriate and accurate use of laboratory equipment.
- Collect and evaluate animal tissue/fluid samples.
- Identify common parasites through fecal and external examination.
- Perform safe and appropriate injection techniques.
- Demonstrate surgical preparation procedures for various animal species.
- Demonstrate preparation and sterile handling of surgical instrument packs.

Clinical Procedures III **3 Credits/90 Clock-Hours**

The Clinical Procedures III course is the final clinical course for students and fills in any gaps they may have in their practical knowledge. The course provides students with the opportunity to strengthen animal care skills in the practice laboratory. The course brings together all the theoretical and practical knowledge to prepare students to be comfortable with the range of duties they will face in a practical setting. Students build on their knowledge of anatomy through a feline dissection in the lab. The course also covers some of the specialized techniques they may need for various species. Students who complete this course are prepared for a position as a skilled assistant.

Objectives:

- Demonstrate grooming procedures for various species.
- Demonstrate procedures used in ophthalmic and otic treatments.
- Demonstrate IV catheterization.
- Perform common bandaging.
- Perform specialized care treatments for birds.
- Interact comfortably with pocket pets.
- Perform feline dissection.

Clinical Externship **4 Credits/180 Clock-Hours**

This Clinical Externship course gives students the opportunity to demonstrate the knowledge and skills they have obtained from their classroom and laboratory experiences. This course provides 180 hours of clinical experience in actual veterinarian animal care settings. Students will practice all the techniques and skills they have learned throughout the program with real patients and clients. Students who complete this course have real world experience applying what they have learned in a clinical setting.

Objectives:

- Demonstrate office skills involving scheduling, greeting, collecting accurate patient history, and following up with clients.
- Assist in physical examinations.
- Demonstrate proper restraint techniques and perform common bandaging.
- Demonstrate correct medical calculations.
- Demonstrate safe handling skills with needles/syringes and perform injections on animals.
- Perform accurate diagnostic imaging.
- Demonstrate appropriate and accurate use of laboratory equipment.
- Demonstrate surgical preparation procedures for various animal species.
- Demonstrate preparation and sterile handling of surgical instrument packs.
- Demonstrate appropriate grooming procedures for various species.
- Demonstrate procedures used in ophthalmic treatments.
- Demonstrate IV catheterization.

NON-ALIGNED (ELECTIVE) COURSES

Bridgerland Technical College

Patient Management and Nutrition **3 Credits/90 Clock-Hours**

The Patient Management and Nutrition course introduces students to the essential skills needed to maintain gainful and satisfying employment in veterinary assisting careers. Students learn the basic anatomy and physiology of various species encountered in a veterinary practice. Common medical treatments for typical injuries and ailments of various animals are covered. Students also learn to understand and comprehend the reasons for animal behavior; the symptoms and signs to watch for in animal behavior; and how to individualize the care for each patient. Students who complete this course are prepared for an entry-level position in the field. They also have the necessary knowledge and skills to participate in an externship.

Objectives:

- Explain the major concepts of anatomy and physiology.
- Evaluate diets for nutritional needs of various animal species based on knowledge of nutritional needs.
- Use problem-solving skills.
- Perform safe, competent, and individualized care on various animal species.
- Perform accurate medical calculations.
- Describe behaviors of various animal species and how they affect care methods.

Vet Assist Clinical Sciences **1 Credit/30 Clock-Hours**

The Vet Assist Clinical Sciences course provides students with knowledge and skills used in clinical settings for diagnosis and care of many conditions and diseases found in a variety of animal species. This course covers hematology and clinical chemistry for animals. Students learn specific microbiology and how to understand urinalysis for their patients. Parasites and their relationships with animals are covered. The course instructs students on the fundamentals of anesthesia and appropriate analgesics and preventative medicine for animals. Students who complete this course have a strong theoretical foundation of chemical and biological information upon which they can build in their clinical courses.

Objectives:

- Identify the concepts related to hematology, hemostasis processes, and clinical chemistry.
- Explain the concepts related to microbiology, cytology, and urinalysis.
- Explain the impact of pathology and pharmacology on various animal species.
- Recognize parasites, their hosts, and the relationship between them.
- Explain principles of preventive medicine as it relates to animal sciences.
- Explain procedures for diagnostic imaging.
- Explain procedures for anesthesia and perioperative analgesia.

Snow College

Introduction to Animal Science **4 Credits/120 Clock-Hours**

This basic course introduces students to the importance of food animal production and the value of companion animal care in our modern society. Application of animal health, nutrition through feeding and feed management, production, reproduction as they relate to our food production system and companion animal values and needs.

Objectives:

- Discuss food animal production systems and the numerous contributions animals make to our society for food and companionship.
- Understand the companion animal relationships with societies' needs and values.
- Identify nutritional needs of various animal species.
- Perform safe, competent, and individualized animal care.
- Describe animal behaviors.
- Identify the concepts of microbiology, cytology, and urinalysis.

Medical Terminology **2 Credits/60 Clock-Hours**

Medical Terminology provides instruction on how to interpret and understand the technical language of medicine. Students learn the basic structure of medical terms including prefixes, suffixes, word roots, special endings, plural forms, abbreviations, and symbols. Emphasis is placed on the correct spelling, definition, application, and pronunciation of each term.

Objectives:

- Identify the four types of word parts in forming medical terms.
- Demonstrate construction of medical terms by correctly spelling, pronouncing, defining, and identifying selected terms.
- Identify and apply acceptable medical abbreviations.
- Use knowledge of word parts to define unfamiliar medical terms.

Anatomy and Physiology of Domestic Animals & a lab **4 Credits/120 Clock-Hours**

This class is a study of the anatomy of domestic animals and the functions of various systems. Each system is studied separately with emphasis on the skeletal, circulatory, digestive, respiratory, and reproductive systems. The scientific method will be explored as it relates to the ever-increasing knowledge of how to manage domestic animals/livestock for maximum health and optimum production and companionship. AGBS 2205 Anatomy and Physiology of Domestic Animals lab is a corequisite for this course. Students will know and understand terminology used to describe an animal's anatomy and physiology. This laboratory setting allows students to physically examine domestic animal tissues, organs, and systems.

Objectives:

- Discuss the basic biology of cells and their function as they relate to the anatomy and physiology of animals.
- Identify the structures of animal systems.
- Describe physiology of animal body systems
- Through seeing and handling of animal organs, identify the size, shape, and function of parts of organs, organs, parts of systems and systems.
- Apply names and terms used in class to actual animal organs and systems.
- Discuss the complexity of organ physiology as part of the animal systems.

Animal Nutrition Management **4 Credits/120 Clock-Hours**

Different digestive tracts of farm and companion animals related to digestive physiology will be studied. Animal nutrient needs for health and production are applied to each animal species. Feed composition and feed uses, feed costs along with feed analysis are performed, analyzed, and applied in balancing

feed least cost rations are developed to meet production goals for each livestock species and pets using a pencil, a calculator, and a computer.

Objectives:

- Apply animal feeding principles associated with different animal species and livestock operations.
- Collect and prepare feed samples for nutrient analysis.
- Analyze feedstuffs and interpret feed analysis reports for protein, energy, fats, macro and micro minerals and water.
- Completers will balance rations for various livestock species that meets production goals.
- Explain the economics of livestock feeding and develop least-cost rations for various livestock species and production goals.
- Discuss animal nutrition, animal health, and relationships between “disease” nutrient deficiencies.

UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Welding Technology
FY2025 / 15 Credits (450 Clock-Hours)

Welding Technology

Institutions: Bridgerland, Davis, Dixie, Mountainland, Ogden-Weber, Salt Lake, Snow, Southwest, Tooele, Uintah Basin, USU-E

Certificate of Program Completion (Catalog Year: 2025, 15 Credits/450 Clock-Hours Required, CIP: 48.0508)

Aligned (15 Credits/450 Clock-Hours)		**Credits**	**Clock-Hours**
TEWT 1000	Introduction to Welding and Cutting	2	60
TEWT 1010	Measurement Systems	1	30
TEWT 1111	Shielded Metal Arc Welding (SMAW) I	2	60
TEWT 1112	Shielded Metal Arc Welding (SMAW) II	2	60
TEWT 1211	Gas Tungsten Arc Welding (GTAW) I	2	60
TEWT 1212	Gas Tungsten Arc Welding (GTAW) II	2	60
TEWT 1311	Gas Metal Arc Welding (GMAW) I	2	60
TEWT 1411	Flux Cored Arc Welding (FCAW) I	2	60
Non-Aligned (Electives)			
Bridgerland Technical College (15 Credits/450 Clock-Hours)			
TEWT 1005	Machining for Manufacturing Trades	3	90
TEWT 1020	Welding Symbols and Print Reading	2	60
TEWT 1312	Gas Metal Arc Welding (GMAW) II	2	60
TEWT 1412	Flux Cored Arc Welding (FCAW) II	2	60
TEWT 1130	Shielded Metal Arc Welding (SMAW) III	2	60
TEWT 1330	Gas Metal Arc Welding (GMAW) Aluminum & Stainless Steel	1	30
TEWT 1030	Automated Cutting and Welding	1	30
TEWT 1040	Welding Inspection and Welding Metallurgy	1	30
TEWT 1500	Introduction to Other Welding Processes	1	30
TEWT 1700	Workplace Readiness	1	30
TEWT 1600	Welding Layout & Fabrication	2	60
TEWT 2999	Welding Externship	2	90
Davis Technical College (9 Credits/270 Clock-Hours)			
TEWT 1008	Welding for Manufacturing	2	60
TEWT 1045	Inspection, Metallurgy, and Blueprints	2	60
TEWT 1450	Flux Cored Arc Welding Gas Shielded: AWS Certification Preparation	1	30
TEWT 1312	Gas Metal Arc Welding (GMAW) II	2	60
TEWT 1050	Oxy Fuel Welding and Brazing Lab	2	60
TEWT 1335	Aluminum Gas Metal Arc Welding (GMAW)	1	30
TEWT 2000	Advanced Welding Processes	1	30
TEWT 1800	Welding Sculpture I	2	60
TEWT 1810	Welding Sculpture II	2	60
TEWT 2010	Welding Special Projects I	2	60
TEWT 2020	Welding Special Projects II	2	60
TEWT 2030	Welding Special Projects III	2	60
TEWT 1150	Shielded Metal Arc Welding Certification Preparation	1	30
TEWT 1350	Gas Metal Arc Welding Certification Preparation	1	30
TEWT 1820	SkillsUSA Preparation	2	60
TEWT 1900	Welding Skills Practice	1	30
TEWT 1905	Welding Skills Practice II	1	30
TEWT 1910	Welding Skills Practice III	1	30
TEWT 1915	Welding Skills Practice IV	1	30
TEWT 1920	Welding Skills Practice V	1	30
TEWT 1925	Welding Skills Practice VI	2	60
Dixie Technical College (15 Credits/450 Clock-Hours)			
TEWT 1020	Welding Symbols and Print Reading	2	60

UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Welding Technology
FY2025 / 15 Credits (450 Clock-Hours)

TEWT 1312	Gas Metal Arc Welding (GMAW) II	2	60
TEWT 1412	Flux Cored Arc Welding (FCAW) II	2	60
TEWT 1131	Shielded Metal Arc Welding (SMAW) III	2	60
TEWT 1230	Gas Tungsten Arc Welding (GTAW) III	2	60
TEWT 1710	Career Success	1	30
TEWT 1605	Welding Fabrication	2	60
TEWT 1930	Welder Qualifications	2	60
Mountainland Technical College (15 Credits/450 Clock-Hours)			
TEWT 1020	Welding Symbols and Print Reading	2	60
TEWT 1315	Gas Metal Arc Welding (GMAW) II	3	90
TEWT 1413	Flux Cored Arc Welding (FCAW) II	3	90
TEWT 1001	Introduction to Welding and Cutting II	1	30
TEWT 1132	Shielded Metal Arc Welding (SMAW) III	3	90
TEWT 1231	Gas Tungsten Arc Welding (GTAW) III	2	60
TEWT 1511	Submerged Arc Welding (SAW)	1	30
Ogden-Weber Technical College (15 Credits/450 Clock-Hours)			
TEWT 1020	Welding Symbols and Print Reading	2	60
TEWT 1312	Gas Metal Arc Welding (GMAW) II	2	60
TEWT 1412	Flux Cored Arc Welding (FCAW) II	2	60
TEWT 1040	Welding Inspection and Welding Metallurgy	1	30
TEWT 2130	Projects	2	60
TEWT 1060	Related Equipment	2	60
TEWT 1935	Endorsements	2	60
TEWT 1720	Industry Prep	1	30
TEWT 1520	Metal Finishing	1	30
Salt Lake Community College (15 Credits/450 Clock-Hours)			
TEWT 1055	Oxy Fuel	1	30
TEWT 1020	Welding Symbols and Print Reading	2	60
TEWT 1312	Gas Metal Arc Welding (GMAW) II	2	60
TEWT 1412	Flux Cored Arc Welding (FCAW) II	2	60
TEWT 1133	Shielded Metal Arc Welding (SMAW) III	2	60
TEWT 1333	Gas Metal Arc Welding (GMAW) III	2	60
TEWT 1430	Flux Cored Arc Welding (FCAW) III	2	60
TEWT 1040	Welding Inspection and Welding Metallurgy	1	30
TEWT 1901	Welding Skill Practice I	1	30
TEWT 1906	Welding Skill Practice II	1	30
TEWT 2011	Welding Special Projects I	1	30
TEWT 2021	Welding Special Projects II	1	30
Snow College (15 Credits/450 Clock-Hours)			
TEWT 1020	Welding Symbols and Print Reading	2	60
TEWT 1312	Gas Metal Arc Welding (GMAW) II	2	60
TEWT 1412	Flux Cored Arc Welding (FCAW) II	2	60
TEWT 2100	Specialized Shielded Metal Arc Welding (SMAW) I	3	90
TEWT 2110	Specialized Shielded Metal Arc Welding (SMAW) II	3	90
TEWT 2200	Specialized Gas Tungsten Arc Welding (GTAW) I	3	90
TEWT 2210	Specialized Gas Tungsten Arc Welding (GTAW) II	3	90
TEWT 2300	Specialized Gas Metal Arc Welding (GMAW) I	3	90
TEWT 2310	Specialized Gas Metal Arc Welding (GMAW) II	3	90
TEWT 2400	Specialized Flux Cored Arc Welding (FCAW) I	3	90
TEWT 2410	Specialized Flux Cored Arc Welding (FCAW) II	3	90
TEWT 1610	Metal Fabrication I	3	90
TEWT 1615	Metal Fabrication II	3	90

UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Welding Technology
FY2025 / 15 Credits (450 Clock-Hours)

TEWT 1070	Weld Inspection and Testing	3	90
Southwest Technical College (9 Credits/270 Clock-Hours)			
TEWT 1045	Inspection, Metallurgy, and Blueprints	2	60
TEWT 1450	Flux Cored Arc Welding Gas Shielded: AWS Certification Preparation	1	30
TEWT 1312	Gas Metal Arc Welding (GMAW) II	2	60
TEWT 1900	Welding Skills Practice	1	30
TEWT 1620	Fabrication Tools	1	30
TEWT 1003	Advanced Thermal Cutting and Brazing	2	60
Tooele Technical College (9 Credits/270 Clock-Hours)			
TEWT 1045	Inspection, Metallurgy, and Blueprints	2	60
TEWT 1450	Flux Cored Arc Welding Gas Shielded: AWS Certification Preparation	1	30
TEWT 1336	Aluminum Gas Metal Arc Welding (GMAW)	1	30
TEWT 1530	Basic CNC Cutting and Operation	1	30
TEWT 1535	Advanced CNC Cutting and Operation	2	60
TEWT 1630	Basic Sheet Metal Welding	2	60
TEWT 1640	Basic Sheet Metal Fabrication	1	30
TEWT 1645	Advanced Sheet Metal Fabrication	1	30
TEWT 1540	Basic Tube Notching and Welding	1	30
TEWT 1440	FCAW Self-Shielded Welding	2	60
TEWT 1040	Welding Inspection and Welding Metallurgy	1	30
TEWT 1006	Machining for Welders	2	60
TEWT 1801	Welding Sculpture I	2	60
TEWT 1811	Welding Sculpture II	2	60
TEWT 1900	Welding Skills Practice	1	30
TEWT 1907	Welding Skill Practice II	2	60
TEWT 2012	Welding Special Projects	2	60
TEWT 1945	Weld Test/Job Preparation	1	30
Uintah Basin Technical College (15 Credits/450 Clock-Hours)			
TEWT XXXX			
Utah State University - Eastern (15 Credits/450 Clock-Hours)			
TEWT 1020	Welding Symbols and Print Reading	2	60
TEWT 1312	Gas Metal Arc Welding (GMAW) II	2	60
TEWT 1412	Flux Cored Arc Welding (FCAW) II	2	60
TEWT 1340	Gas Metal Arc Welding (GMAW) and Flux-Cored Arc Welding (FCAW) Theory	2	60
TEWT 1240	Gas Tungsten Arc Welding (GTAW) Theory	2	60
TEWT 1140	Shielded Metal Arc Welding (SMAW) Theory	2	60
TEWT 2140	Advanced Shielded Metal Arc Welding (SMAW)	5	150
TEWT 2340	Advanced Gas Metal Arc Welding (GMAW) and Flux-Cored Arc Welding (FCAW)	5	150
TEWT 1550	Related Welding Processes	5	150
TEWT 2240	Advanced Gas Tungsten Welding (GTAW)	5	150
TEWT 1545	Advanced Pipe Welding	5	150
TEWT 1730	Professional Vocational Leadership	2	60
TEWT 1815	Welding Sculpture	3	90
TEWT 1650	Practical Fabrication and Layout	5	150
TEWT 1075	Weld Inspection	3	90
TEWT 1080	Welding Metallurgy	3	90

UTAH SYSTEM OF HIGHER EDUCATION

Utah System of Higher Education
Welding Technology
FY2025 / 15 Credits (450 Clock-Hours)

PROGRAM DESCRIPTION

In the Welding Technology certificate program, students receive hands-on safety, welding, and cutting instruction on a variety of metals. Instruction includes basic Oxy Fuel Cutting (OFC), Gas Metal Arc Welding (GMAW), Shielded Metal Arc Welding (SMAW), Flux Cored Arc Welding (FCAW), Gas Tungsten Arc Welding (GTAW), and other thermal and mechanical cutting processes. Students also learn welding process-specific and welding shop safety practices, basic print reading, and the proper uses and applications of AWS welding symbols.

Objectives:

- Demonstrate welding safety on a daily basis.
- Use measurement systems, written instructions, and prints to complete welding projects.
- Use GMAW, FCAW, GTAW, and SMAW to perform high-quality welds on various metals correctly.
- Use thermal cutting equipment to perform high-quality cuts on ferrous and non-ferrous metals.
- Determine the correct welding and/or cutting process to use in specific applications.

ALIGNED COURSE DESCRIPTIONS

Introduction to Welding and Cutting — 2 Credit/60 Clock-Hours

This course will serve students as an introduction to the welding industry. General welding shop safety, thermal cutting processes, basic welding terminology, and arc welding basics will be discussed.

Objectives:

- Demonstrate safety as it relates to welding and manufacturing.
- Perform cuts using thermal cutting processes.
- Identify and define basic welding terminology.
- Demonstrate safe set-up of arc welding equipment.
- Perform basic welds on carbon steel.
- Demonstrate clear communication in the workplace.
- Demonstrate effective workplace habits and attitudes.

Measurement Systems — 1 Credits/30 Clock-Hours

In this course, students gain an understanding of the concepts and implementation of measurement systems used by welding professionals. US customary units, metric units, and utilization of basic measurement tools are discussed.

Objectives:

- Correctly read a tape measure.
- Perform fraction and decimal conversions.
- Perform metric and US customary unit conversions.
- Perform basic trigonometry functions as they relate to welding and fabrication.
- Use basic measurement systems correctly common in the welding industry by applying course concepts.

Shielded Metal Arc Welding (SMAW) I **2 Credits/60 Clock-Hours**

This course teaches the set-up, operation, and practical uses of Shielded Metal Arc Welding. Process advantages and limitations are discussed. Students receive hands-on instruction regarding SMAW standard procedures and best practices in accordance with current industry standards.

Objectives:

- Demonstrate safety and best practices of SMAW-specific welding.
- Setup and operate appropriate SMAW equipment.
- Identify process advantages and limitations.
- Perform 1F and 1G welds with SMAW.
- Perform 2F and 2G welds with SMAW.

Shielded Metal Arc Welding (SMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in hands-on uses and practical application of SMAW. Students learn to reason through appropriate electrode diameters, classifications, and appropriate current levels necessary to achieve proficiency in SMAW.

Objectives:

- Describe the advantages and limitations of SMAW.
- Select proper electrode classifications for their appropriate applications.
- Select proper welding current for specified electrode classification and diameter.
- Perform 3F and 3G welds with SMAW.
- Perform 4F and 4G welds with SMAW.

Gas Tungsten Arc Welding (GTAW) I **2 Credits/60 Clock-Hours**

This course teaches set-up, operation, and practical application of GTAW using ferrous steel. Process advantages and limitations will be discussed. Students receive hands-on instruction regarding GTAW standard procedures and best practice in accordance with current industry standards.

Objectives:

- Demonstrate safety and best practices of GTAW-specific welding.
- Setup and operate appropriate GTAW equipment.
- Identify process advantages and limitations.
- Perform 1F, 1G, 2F and 2G welds on ferrous metals using GTAW.
- Perform 3F, 3G, 4F and 4G welds on ferrous metals using GTAW.

Gas Tungsten Arc Welding (GTAW) II **2 Credits/60 Clock-Hours**

This course expands student competency in hands-on uses and practical application of GTAW using non-ferrous metals. Electrode classifications, preparation, and tip geometries are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for GTAW proficiency.

Objectives:

- Describe the advantages and limitations of GTAW.
- Select proper electrode classifications for their appropriate applications.
- Describe electrode classifications along with the appropriate uses and tip configurations.
- Perform 1F and 1G welds on non-ferrous metals with GTAW.
- Perform 2F and 2G welds on non-ferrous metals with GTAW.

Gas Metal Arc Welding (GMAW) I **2 Credits/60 Clock-Hours**

This course teaches set-up, operation, and practical application of GMAW. Process advantages and limitations are discussed. Students receive hands-on instruction regarding GMAW standard procedures and best practice in accordance with industry standards using short-circuiting and axial spray metal transfer modes.

Objectives:

- Demonstrate safety and best practices of GMAW-specific welding.
- Setup and operate appropriate GMAW equipment.
- Identify process advantages and limitations.
- Perform 1F, 1G, 2F and 2G welds using GMAW-S.
- Perform 1F, 1G, and 2F welds using GMAW axial spray transfer.

Flux Cored Arc Welding (FCAW) I **2 Credits/60 Clock-Hours**

This course covers set-up, operation, and practical application of FCAW. Process advantages and limitations are discussed. Students receive hands-on instruction regarding FCAW standard procedures and best practices in accordance with current industry standards.

Objectives:

- Demonstrate safety and best practices of FCAW-specific welding.
- Setup and operate of appropriate FCAW equipment.
- Identify process advantages and limitations.
- Perform 1F and 1G welds with FCAW.
- Perform 2F and 2G welds with FCAW.

NON-ALIGNED (ELECTIVE) COURSE DESCRIPTIONS

Bridgerland Technical College

Machining for Manufacturing Trades **3 Credits/90 Clock-Hours**

This is a course to support manufacturing programs related to machining. It gives students a working overview of industrial machine shop practice. This course is designed to teach principles and techniques of manufacturing processes by learning to operate the lathe and mill. Students will be trained in areas of blueprint reading, hand tools, machining and part inspection, all with the use of manual machines.

Objectives:

- Identify safe practices in a machine shop.
- Identify correct clean up procedures.
- Demonstrate basic layout procedures.
- Read and interpret blueprints.
- Safely setup and operate a band saw.
- Safely operate a bench grinder and hand tools.
- Accurately use and read steel rules, micrometers, and calipers.
- Perform safe and effective use of lathes and milling machines.
- Perform basic programming and use controls of a CNC machine.

Welding Symbols and Print Reading **2 Credits/60 Clock-Hours**

This course teaches students to interpret prints and drawings including welding symbols used in the welding and fabrication industries. Engineering drawings are introduced as the medium by which the engineer, project manager, and/or draftsman communicates instructions to production welding personnel.

Objectives:

- Identify various American Welding Society (AWS) welding symbols.
- Identify basic line types used in mechanical drawings.
- Demonstrate basic sketching techniques and object representations.
- Create alternate views from existing views.
- Use drawing notes, specifications, title blocks, and bills of materials correctly.

Gas Metal Arc Welding (GMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in the practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection as necessary for GMAW proficiency. The pulsed-spray (GMAW-P) metal transfer mode will be introduced.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.

Flux Cored Arc Welding (FCAW) II **2 Credits/60 Clock-Hours**

This course expands student competency in hands-on uses and practical application of FCAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for FCAW proficiency.

Objectives:

- Describe the advantages and limitations of FCAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F and 3G welds with FCAW.
- Perform 4F and 4G welds with FCAW.

Shielded Metal Arc Welding (SMAW) III **2 Credit/60 Clock-Hours**

The Shielded Metal Arc Welding (SMAW) III course teaches intermediate skills in the SMAW process, with an emphasis on open root joints in all positions. Students are introduced to advanced welding skills on mild steel pipe in the 2F, 5F, 2G and 5G positions.

Objectives:

- Identify the technical terms of the V-groove open root welding joint.
- Demonstrate proper preparation and tacking techniques for plate and pipe coupons.
- Demonstrate proper deposit of a root pass on pipe and plate using E6010 electrodes.
- Complete open root welds on plate.
- Complete open root welds on pipe.

Gas Metal Arc Welding (GMAW) Aluminum and Stainless Steel **1 Credit/30 Clock-Hours**

The Gas Metal Arc Welding (GMAW) Aluminum and Stainless Steel course teaches students the special challenges that both aluminum and stainless steel pose to welders. Students practice welding on these metals by welding in various joints and positions.

Objectives:

- Explain the characteristics of aluminum and stainless steel and the steps required to weld these metals successfully.
- Set up equipment correctly for welding aluminum and stainless steel.
- Prepare aluminum and stainless steel correctly.
- Complete groove welds on aluminum and stainless steel.
- Complete fillet welds on aluminum and stainless.

Automated Cutting and Welding **1 Credit/30 Clock-Hours**

The Automated Cutting and Welding course introduces students to CNC Plasma Arc Cutting and welding robotically. Students learn the basics of the CAD, CAM, and CNC and how to use each with a cutting table. The welding robot is introduced.

Objectives:

- Demonstrate automated Plasma Arc Cutting.
- Demonstrate proper nozzle choice and computer settings.
- Design various parts for the Plasma Arc Cutting table.
- Explore robotics use in the welding industry.

Welding Inspection and Welding Metallurgy **1 Credit/30 Clock-Hours**

The Welding Inspection and Welding Metallurgy course introduces students to welding inspection and basic metallurgy. Students will gain a basic understanding of how metals behave during heating and cooling and the microscopic structure of metals and these effects on the weldability.

Objectives:

- Identify differences between ferrous and non-ferrous metals.
- Explain the effects of heat and cooling of metals.
- Demonstrate basic weld puddle dynamics.
- Explain various codes and standards.
- Identify common discontinuities and causes.

Introduction to Other Welding Processes **1 Credit/30 Clock-Hours**

The Introduction to Other Welding Processes course covers the basics of other commonly used welding processes. Students have the opportunity to practice some of these techniques. This course also introduces students to emerging processes as welding technology is changing rapidly.

Objectives:

- Explain common welding processes.
- Define AWS abbreviations.
- Demonstrate resistance spot welding.
- Demonstrate submerged arc welding.
- Demonstrate plastic welding.

- Explain the fundamentals of laser beam welding, electroslag welding, electrogas welding, and stud welding.

Workplace Readiness **1 Credit/30 Clock-Hours**

The Workplace Readiness course teaches students how to prepare a resume and perform in an interview in the welding industry. This course covers key technical terms and common employment related issues. This course allows students to explore and improve on soft skills needed in the workplace.

Objectives:

- Prepare a quality resume and discuss with the instructor.
- Perform a self-evaluation on employability skills and discuss with the instructor.
- Complete the final welding knowledge test.
- Explore and discuss common interview questions.

Welding Layout & Fabrication **1 Credit/30 Clock-Hours**

The Welding Layout & Fabrication course emphasizes the proper use of fabrication tools and methods of layout and fabrication. Students learn how to fit and tack weldments and to increase product quality. They practice reading and following plans and welding procedures to create weldments.

Objectives:

- Demonstrate proper care and use of fabrication tools.
- Create a bill of materials.
- Prepare materials.
- Lay out and tack weldments properly.
- Follow plans and welding procedure specifications correctly.
- Inspect completed weldments.
- Demonstrate critical thinking and problem solving when fabricating.

Welding Externship **2 Credit/90 Clock-Hours**

The Welding Externship course develops the practical application of classroom skills in the workplace. It implements real-world work experience using decision-making, critical thinking, and problem-solving skills. Companies will assign projects to the student and provide objective feedback on the student's performance in the workplace. Customized student learning objectives will be developed addressing the individual needs of the company and the career interests of each student. Students who complete this course can apply skills in a real-world setting.

Objectives:

- Create personalized objectives (with supervisor) to be accomplished during the externship.
- Demonstrate competency in all skill areas being evaluated by a supervisor.
- Maintain proper attendance and communication for the duration of the externship.
- Demonstrate ability to receive constructive criticism and improvement suggestions.
- Demonstrate soft skills and technical skills to successfully complete set objectives by the end of the externship.

Utah System of Higher Education
Welding Technology
FY2025 / 15 Credits (450 Clock-Hours)

Davis Technical College

Welding for Manufacturing — 2 Credits/60 Clock-Hours

Welding for Manufacturing includes the basic knowledge of Gas Metal Arc Welding (GMAW) and Shielded Metal Arc Welding (SMAW). During this course, you will study welding safety, protection, accident prevention, and troubleshooting. You will practice set-up, operation of equipment, positions, executions, and the workmanship needed for a basic weld.

Objectives:

- Describe oxy fuel cutting process terms.
- Demonstrate proper equipment setup, usage, cleaning, and break-down.
- Discuss and conduct safety inspections of equipment and accessories.
- List and describe oxy fuel cutting equipment.
- Perform setup, lighting and use of oxy fuel cutting equipment.
- Demonstrate various cutting techniques including straight cuts, beveling, and gouging on various base metals.
- Name key terms for GMAW.
- Make GMAW-S (Short Circuit) Fillet Welds the 2F position.
- Make GMAW-S (Short Circuit) Groove Welds in the 2G position.
- Make GMAW-S (Short Circuit) V Groove Welds in the 2G position.
- List key terms for SMAW.
- Perform Fillet welds on mild carbon steel with E7018 welding.
- Perform Groove welds in the Flat (1G) and horizontal (2G) with 7018.

Inspection, Metallurgy, and Blueprints — 2 Credits/60 Clock-Hours

This course will introduce students to welding symbols and blueprints that welding professionals use. Discussing different welding processes and materials that can be welded. Basic AWS standards and types of nondestructive testing (NDT) and destructive testing will be covered.

Objectives:

- Discuss codes, standards, and types of nondestructive and destructive testing.
- Identify and interpret basic AWS standardized welding symbols, blueprints, and bill of materials.
- Identify parts of a joint, parts of a weld, and how they correspond with blueprints.
- Identify and state various stresses a weld can be subjected to.
- Explain welder qualifications, certification, and welding procedure specifications (WPS).

Flux Cored Arc Welding Gas Shielded: AWS Certification Preparation — 1 Credit/30 Clock-Hours

In this course, students will use the knowledge gained in previous courses to pass an AWS welder qualification. Instructors will guide students through the intricacies of the AWS D1.1 welder qualification requirements, emphasizing the practical application of welding principles.

Objectives:

- Analyze a Welding Procedure Specification by reading and interpreting its contents.
- Explain the visual acceptance requirements outlined in the AWS D1.1 code.
- Execute welds within the defined parameters stated in the welding procedure specification (WPS).
- Complete the necessary steps to successfully pass the FCAW-G AWS test according to the AWS D1.1 code.

Gas Metal Arc Welding (GMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in the practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection as necessary for GMAW proficiency. The pulsed-spray (GMAW-P) metal transfer mode will be introduced.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.

Oxy Fuel Welding and Brazing Lab **2 Credits/60 Clock-Hours**

Oxy Fuel Welding and Brazing Lab explores how to set oxy-fuel welding (OFW) equipment and select proper torch bodies and tips. In addition, students will study the effects of torch angle, flame height, filler metal size, and welding speed on gas welds and brazing. During this course, students will perform a variety of weld joints in the Flat (1F) position on thin and thick gauge mild steel. Students will also demonstrate welding on a small diameter tube and pipe.

Objectives:

- Define key terms for oxy fuel welding and brazing.
- Explain how to set up and weld mild steel.
- Explain the effects of torch angle, flame height, filler metal size, and welding speed on gas welds.
- Apply directions using key oxy fuel welding and brazing terms.
- Set a torch for welding.
- Explain differences between welding and brazing.
- Perform stringer beads, outside corner joints, butt joints, lap joints, and tee joints.
- Perform welds and brazing on tube or small diameter pipe to plate.

Aluminum Gas Metal Arc Welding (GMAW) **1 Credit/30 Clock-Hours**

Aluminum Gas Metal Arc Welding students explore how to weld aluminum using the Gas Metal Arc Welding (GMAW) Process. Throughout this course, students will analyze aluminum alloys, elements, temper designations, filler metal selections, and preparation of base metals. Students will also perform Fillets and Grooves in Flat (1G), Horizontal (2F) and Vertical (3F) positions.

Objectives:

- Describe the properties of aluminum.
- Explain how and when to use filler metal selections and demonstrate preparation of base metals.
- Use general guidelines for welding aluminum with the GMAW process.
- Perform fillet and grooves in Flat (1G), Horizontal (2F) and Vertical (3F) positions using the GMAW process.

Advanced Welding Processes **1 Credit/30 Clock-Hours**

In Advanced Welding Processes students will learn how to use advanced features of the welding machines. They will learn when these advanced features will be useful while working in the welding industry and how the functions can improve their job performance.

Objectives:

- Explain the benefits and effects of various gas blends.
- Use advanced controls and features of welding equipment.
- Describe common pulse modes and their applications.
- Discuss the effect of frequency, voltage, and amperage.
- Distinguish between the three modes of transfer (short-circuit, globular and spray).

Welding Sculpture I **2 Credits/60 Clock-Hours**

Welding Sculpture I provides the opportunity to work with instructors to design and build a welding sculpture. Throughout this course, students will use Ferrous and Non-Ferrous metals. The sculpture students design must be an original, creative artwork. Students may use all welding processes to create the sculpture. Students will also document the creation of the sculpture in a notebook with pictures, receipts for materials, concept sketches and anything done in the creation of the sculpture.

Objectives:

- Create a welding sculpture that does not exceed the maximum size of 18” tall X 12” wide X 18” long and 150 pounds.
- Form a welding sculpture that is one continual piece, not multiple unconnected pieces.
- Document steps taken to create the sculpture to include pictures, receipts for materials, concept sketches, and anything done in the creation of the sculpture.

Welding Sculpture II **2 Credits/60 Clock-Hours**

Welding Sculpture II offers additional time for completing the welding sculpture started in Welding Sculpture course. Students will need to continue documenting the creation of the sculpture in a notebook with pictures, receipts for materials, concept sketches, and anything done in the creation of the sculpture.

Objectives:

- Create a welding sculpture that does not exceed the maximum size of 18” tall X 12” wide X 18” long and 150 pounds.
- Form a welding sculpture that is one continual piece, not multiple unconnected pieces.
- Document steps taken to create the sculpture to include pictures, receipts for materials, concept sketches, and anything done in the creation of the sculpture.

Welding Special Projects I **2 Credits/60 Clock-Hours**

Students in this course will work with instructors to design and build an instructor approved project using Shielded Metal Arc Welding (SMAW), Flux Core Arc Welding (FCAW), Gas Metal Arc Welding (GMAW), or Gas Tungsten Arc Welding (GTAW) process. Students must define a timeline that will allow for the project to be completed on time, create a three-view blueprint with weld symbols, provide a cost estimate of materials and parts list, build the project to American Welding Society (AWS) Standards, and pass inspection. Student projects must not exceed course hours and students must prepay for project materials.

Objectives:

- Discuss and solve basic welding fabrication math problems.
- Demonstrate the proper placement of tack welds.
- Explain how to adjust parts to meet the tolerance.
- Describe how to adjust for weld distortion.
- Lay out and trace parts.

- Assemble and fit up parts for welding by following blueprints.

Welding Special Projects II **2 Credits/60 Clock-Hours**

This course is a continuation of Welding Special Projects I. Students in this course will work with instructors to design and build an instructor approved project using Shielded Metal Arc Welding (SMAW), Flux Core Arc Welding (FCAW), Gas Metal Arc Welding (GMAW), or Gas Tungsten Arc Welding (GTAW) process. Students must define a timeline that will allow for the project to be completed on time, create a three-view blueprint with weld symbols, provide a cost estimate of materials and parts list, build the project to American Welding Society (AWS) Standards, and pass inspection. Student projects must not exceed course hours and students must prepay for project materials.

Objectives:

- Discuss and solve basic welding fabrication math problems.
- Demonstrate the proper placement of tack welds.
- Explain how to adjust parts to meet the tolerance.
- Describe how to adjust for weld distortion.
- Lay out and trace parts.
- Assemble and fit up parts for welding by following blueprints.

Welding Special Projects III **2 Credits/60 Clock-Hours**

This course is a continuation of Welding Special Projects II. Students in this course will work with instructors to design and build an instructor approved project using Shielded Metal Arc Welding (SMAW), Flux Core Arc Welding (FCAW), Gas Metal Arc Welding (GMAW), or Gas Tungsten Arc Welding (GTAW) process. Students must define a timeline that will allow for the project to be completed on time, create a three-view blueprint with weld symbols, provide a cost estimate of materials and parts list, build the project to American Welding Society (AWS) Standards, and pass inspection. Student projects must not exceed course hours and students must prepay for project materials.

Objectives:

- Discuss and solve basic welding fabrication math problems.
- Demonstrate the proper placement of tack welds.
- Explain how to adjust parts to meet the tolerance.
- Describe how to adjust for weld distortion.
- Lay out and trace parts.
- Assemble and fit up parts for welding by following blueprints.

Shielded Metal Arc Welding (SMAW) Certification Preparation **1 Credit/30 Clock-Hours**

In the course, students will use the knowledge gained in previous courses to pass an AWS welder qualification. Instructors will guide students through the intricacies of the AWS D1.1 welder qualification requirements, emphasizing the practical application of welding principles.

Objectives:

- Analyze a welding procedure specification by reading and interpreting its contents.
- Explain the visual acceptance requirements outlined in the AWS D1.1 code.
- Execute welds within the defined parameters stated in the welding procedure specification (WPS).
- Complete the necessary steps to successfully pass the SMAW AWS test according to AWS D1.1 code.

Gas Metal Arc Welding (GMAW) Certification Preparation **1 Credit/30 Clock-Hours**

In the course, students will use the knowledge gained in previous courses to pass an AWS welder qualification. Instructors will guide students through the intricacies of the AWS D1.1 welder qualification requirements, emphasizing the practical application of welding principles.

Objectives:

- Analyze a welding procedure specification by reading and interpreting its contents.
- Explain the visual acceptance requirements outlined in the AWS D1.1 code.
- Execute welds within the defined parameters stated in the welding procedure specification (WPS).
- Complete the necessary steps to successfully pass the GMAW AWS test according to AWS D1.1 code.

SkillsUSA Preparation **2 Credits/60 Clock-Hours**

In the SkillsUSA Preparation course, students will take on the important role of preparing for the chosen competition. The primary objective will be to gain a comprehensive understanding of the technical standards specific to the competition. Through this course, students will actively engage in practicing and refining the essential elements and skills required for the competition. These practice sessions will enable students to develop the necessary expertise and proficiency that can be effectively applied during the live regional, state, or national-level competition.

Objectives:

- Recognize the technical standards for the competition.
- Organize all materials needed to complete the competition.
- Practice skills and elements to be performed in the live competition.

Welding Skill Practice **1 Credit/30 Clock-Hours**

In this course, students will further refine skills previously acquired in the program. Working with an instructor, they will perform projects similar to what is found in industry. This course emphasizes independent work, reflecting the expectations placed on industry professionals.

Objectives:

- Evaluate and select specific skills to develop further.
- Apply acquired skills and knowledge through hands-on welding exercises, fostering practical expertise.
- Demonstrate welding techniques under the supervision of experienced instructors, ensuring proficiency.
- Employ effective time management strategies to achieve the desired skill level within the allotted course duration.

Welding Skills Practice II **1 Credit/30 Clock-Hours**

Welding Skill Practice II continues to develop the skills gained in the welding program. Students will work with the instructor to complete one or more projects that are applicable to the skills needed in the welding industry. Students are expected to work independently as per expectations of a program completer in the industry.

Objectives:

- Further enhance and refine the welding skills acquired during the welding program, focusing on practical application and hands-on practice to build competency.

- Collaborate with the instructor to design and complete one or more welding projects that simulate real-world applications, providing opportunities to apply the acquired skills in industry-relevant scenarios.
- Foster independence and self-reliance in welding techniques and project execution, preparing students to meet the expectations of a competent program completer in the welding industry.

Welding Skills Practice III **1 Credit/30 Clock-Hours**

Welding Skill Practice III continues to develop the skills gained in the welding program. Students will work with the instructor to complete one or more projects that are applicable to the skills needed in the welding industry. Students are expected to work independently as per expectations of a program completer in the industry.

Objectives:

- Further enhance and refine the welding skills acquired during the welding program, focusing on practical application and hands-on practice to build competency.
- Collaborate with the instructor to design and complete one or more welding projects that simulate real-world applications, providing opportunities to apply the acquired skills in industry-relevant scenarios.
- Foster independence and self-reliance in welding techniques and project execution, preparing students to meet the expectations of a competent program completer in the welding industry.

Welding Skills Practice IV **1 Credit/30 Clock-Hours**

Welding Skill Practice IV continues to develop the skills gained in the welding program. Students will work with the instructor to complete one or more projects that are applicable to the skills needed in the welding industry. Students are expected to work independently as per expectations of a program completer in the industry.

Objectives:

- Further enhance and refine the welding skills acquired during the welding program, focusing on practical application and hands-on practice to build competency.
- Collaborate with the instructor to design and complete one or more welding projects that simulate real-world applications, providing opportunities to apply the acquired skills in industry-relevant scenarios.
- Foster independence and self-reliance in welding techniques and project execution, preparing students to meet the expectations of a competent program completer in the welding industry.

Welding Skills Practice V **1 Credit/30 Clock-Hours**

Welding Skill Practice V continues to develop the skills gained in the welding program. Students will work with the instructor to complete one or more projects that are applicable to the skills needed in the welding industry. Students are expected to work independently as per expectations of a program completer in the industry.

Objectives:

- Further enhance and refine the welding skills acquired during the welding program, focusing on practical application and hands-on practice to build competency.
- Collaborate with the instructor to design and complete one or more welding projects that simulate real-world applications, providing opportunities to apply the acquired skills in industry-relevant scenarios.

- Foster independence and self-reliance in welding techniques and project execution, preparing students to meet the expectations of a competent program completer in the welding industry.

Welding Skills Practice VI **2 Credits/60 Clock-Hours**

Welding Skill Practice VI continues to develop the skills gained in the welding program. Students will work with the instructor to complete one or more projects that are applicable to the skills needed in the welding industry. Students are expected to work independently as per expectations of a program completer in the industry.

Objectives:

- Further enhance and refine the welding skills acquired during the welding program, focusing on practical application and hands-on practice to build competency.
- Collaborate with the instructor to design and complete one or more welding projects that simulate real-world applications, providing opportunities to apply the acquired skills in industry-relevant scenarios.
- Foster independence and self-reliance in welding techniques and project execution, preparing students to meet the expectations of a competent program completer in the welding industry.

Dixie Technical College

Welding Symbols and Print Reading **2 Credits/60 Clock-Hours**

This course teaches students to interpret prints and drawings including welding symbols used in the welding and fabrication industries. Engineering drawings are introduced as the medium by which the engineer, project manager, and/or draftsman communicates instructions to production welding personnel.

Objectives:

- Identify various American Welding Society (AWS) welding symbols.
- Identify basic line types used in mechanical drawings.
- Demonstrate basic sketching techniques and object representations.
- Create alternate views from existing views.
- Use drawing notes, specifications, title blocks, and bills of materials correctly.

Gas Metal Arc Welding (GMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in the practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection as necessary for GMAW proficiency. The pulsed-spray (GMAW-P) metal transfer mode will be introduced.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.

Flux Cored Arc Welding (FCAW) II **2 Credits/60 Clock-Hours**

This course expands student competency in hands-on uses and practical application of FCAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for FCAW proficiency.

Objectives:

- Describe the advantages and limitations of FCAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F and 3G welds with FCAW.
- Perform 4F and 4G welds with FCAW.

Shielded Metal Arc Welding (SMAW) III **2 Credits/60 Clock-Hours**

The Shielded Metal Arc Welding (SMAW) III course expands students' competency in hands-on uses and practical application of SMAW. Students learn to reason through appropriate parameters necessary to achieve proficiency in SMAW with open root welds and structural steel multi pass welds. Students demonstrate fillets and grooves with E6010 and E7018 electrodes.

Objectives:

- Test the limitations of SMAW.
- Perform 2F multi pass and 2G open root welds with SMAW.
- Perform 3F multi pass and 3G open root welds with SMAW.

Gas Tungsten Arc Welding (GTAW) III **2 Credits/60 Clock-Hours**

The Gas Tungsten Arc Welding (GTAW) III course expands student competency in hands-on uses and practical application of GTAW using non-ferrous metals with an emphasis on stainless steel. Electrode classifications and base metal preparation are taught. Students learn appropriate parameter selection for welding procedure requirements as necessary for GTAW proficiency.

Objectives:

- Describe the advantages and limitations of GTAW.
- Select proper electrode classifications for their appropriate applications.
- Describe electrode classifications along with the appropriate uses and tip configurations.
- Perform 1F and 1G welds on stainless steel metal with GTAW.
- Perform 2F and 2G welds on stainless steel metal with GTAW.
- Perform 3F Uphill welds on stainless steel metal with GTAW.

Career and Workplace Relations **1 Credit/30 Clock-Hours**

The Career and Workplace Relations course is designed to help students gain insight into how their skills and professionalism enhance relationships between management and coworkers. Instruction includes employment skills such as communication, critical thinking, professional etiquette, team dynamics, and more.

Objectives:

- Identify personal and transferable skills, competencies, and/or abilities.
- Create an industry specific resume, cover letter, thank you letter, reference list, and online presence.
- Demonstrate effective interviewing skills.

- Submit an application for an industry specific position.
- Demonstrate effective use of job search websites.

Welding Fabrication **2 Credits/60 Clock-Hours**

The Welding Fabrication course teaches skills needed in fabricating welded metal projects. Students will design and create welded metal projects to demonstrate their knowledge and skills learned in previous courses, SMAW, GMAW, GTAW, and FCAW.

Objectives:

- Demonstrate knowledge of welding processes, principles, measurement skills and choice of materials by fabricating welded metal projects.
- Use SMAW to fabricate a metal project.
- Use GMAW to fabricate a metal project.
- Use GTAW to fabricate a metal project.
- Use FCAW to fabricate a metal project.

Welding Qualification **2 Credits/60 Clock-Hours**

The Welder Qualifications course teaches skills needed to pass various welders qualification test for industry certification. Students will create common welding industry test that are used for job qualifications. Students will use and understand the proper documentation common for welder qualification.

Objectives:

- Complete a 2G SMAW Welders Qualification test.
- Complete a 3G SMAW Welders Qualification test.
- Complete the following American Welding Society projects:
  - GTAW Mild Steel project.
  - GTAW Aluminum project.
  - GTAW Stainless Steel project.
  - GMAW-S project.
  - GMAW Spray Transfer project.
  - FCAW-G project.
  - GMAW-S project.

Mountainland Technical College

Welding Symbols and Print Reading **2 Credits/60 Clock-Hours**

This course teaches students to interpret prints and drawings including welding symbols used in the welding and fabrication industries. Engineering drawings are introduced as the medium by which the engineer, project manager, and/or draftsman communicates instructions to production welding personnel.

Objectives:

- Identify various American Welding Society (AWS) welding symbols.
- Identify basic line types used in mechanical drawings.
- Demonstrate basic sketching techniques and object representations.
- Create alternate views from existing views.
- Use drawing notes, specifications, title blocks, and bills of materials correctly.

Gas Metal Arc Welding (GMAW) II **3 Credits/90 Clock-Hours**

This course expands student competency in hands-on uses and practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for GMAW proficiency. Pulsed-spray (GMAW-P) metal transfer mode and Metal Cored wire will be introduced. Students will be tested on their knowledge of GMAW using the AWS S.E.N.S.E Practical Performance Test and written exam.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.
- Build and weld the AWS Sense Widget.
- Pass the GMAW AWS Sense written test with 80% or higher, within 3 attempts.
- Perform 1F, 2F, and 3F downhill welds with Pulsed Metal Cored.
- Perform 2G Vee and a 3G Vee downhill with Pulsed Metal Cored.

Flux Cored Arc Welding (FCAW) II **3 Credits/90 Clock-Hours**

This course expands student competency in hands-on uses and practical application of FCAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for FCAW proficiency. Students will be tested on their knowledge of FCAW by utilizing the AWS FCAW S.E.N.S.E Level 1 test. Following a blueprint, students build a widget using FCAW-G and FCAW-SS welding processes. Students will also take a practical qualification test that will follow the AWS D1.1 Structural Steel Code standards.

Objectives:

- Describe the advantages and limitations of FCAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F and 3G welds with FCAW.
- Perform 4F and 4G welds with FCAW.
- Pass the FCAW AWS Sense test with 80% or higher, within 3 attempts.
- Build and weld the AWS Sense Widget.
- Attempt the AWS D1.1 Structural Steel FCAW bend test.

Introduction to Welding and Cutting II **1 Credit/30 Clock-Hours**

This course will cover advanced cutting and fitting methods commonly used in the welding industry. Students will work with blueprints, cut lists, and common tools to construct a widget.

Objectives:

- Demonstrate the ability to cut and fit C channel.
- Recognize different temperatures used to cut on thick and thin materials.
- Perform cuts on ½ inch thick plate or thicker materials.
- Cut out a widget, following a specific blueprint.

Shielded Metal Arc Welding (SMAW) III **3 Credit/90 Clock-Hours**

This course follows the AWS Sense Program for SMAW. Students will be required to pass a comprehensive written and practical exam, as well as attempt a welding qualification test using the SMAW process.

Objectives:

- Perform a 1G – 4G, and pass bends on each assignment.
- Correctly read a blueprint to complete a widget that meets the Sense practical testing requirements.
- Pass the SMAW AWS Sense written test with 80% or higher, within 3 attempts.
- Attempt a D1.1 3G structural steel qualification test.
- Cut out a widget, following a specific blueprint.

Gas Tungsten Arc Welding (GTAW) III **2 Credit/60 Clock-Hours**

Gas Tungsten Arc Welding is an advanced level course for welding students. This course will test students on their knowledge of GTAW by utilizing the AWS GTAW Sense Level 1 test. Heat considerations and basic metallurgy will be taught.

Objectives:

- Pass the GTAW AWS Sense test with 80% or higher, within 3 attempts.
- Pass the non-ferrous widget, in accordance with AWS standards.
- Perform 1F and 1G welds on non-ferrous metals.
- Perform 2F and 2G welds on non-ferrous metals.

Submerged Arc Welding (SAW) **1 Credit/30 Clock-Hours**

This course covers set-up, operations and practical application of SAW. Process advantages and limitations will be discussed. Students will receive hands-on instruction regarding SAW standard procedures and best practice in accordance with current industry standards.

Objectives:

- Demonstrate competency of SAW-specific welding safety concerns and best practices.
- Demonstrate competency of appropriate SAW equipment setup and operations.
- Identify process advantages and limitations.
- Perform a 1G Vee weld with a backing strip on solid wire.
- Perform a 1 G Vee weld with a back weld on metal cored wire.
- Perform a 1G Rotated pipe weld.

Ogden-Weber Technical College

Welding Symbols and Print Reading **2 Credits/60 Clock-Hours**

This course teaches students to interpret prints and drawings including welding symbols used in the welding and fabrication industries. Engineering drawings are introduced as the medium by which the engineer, project manager, and/or draftsman communicates instructions to production welding personnel.

Objectives:

- Identify various American Welding Society (AWS) welding symbols.
- Identify basic line types used in mechanical drawings.

- Demonstrate basic sketching techniques and object representations.
- Create alternate views from existing views.
- Use drawing notes, specifications, title blocks, and bills of materials correctly.

Gas Metal Arc Welding (GMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in the practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection as necessary for GMAW proficiency. The pulsed-spray (GMAW-P) metal transfer mode will be introduced.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.

Flux Cored Arc Welding (FCAW) II **2 Credits/60 Clock-Hours**

This course expands student competency in hands-on uses and practical application of FCAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for FCAW proficiency.

Objectives:

- Describe the advantages and limitations of FCAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F and 3G welds with FCAW.
- Perform 4F and 4G welds with FCAW.

Welding Inspection and Welding Metallurgy **1 Credit/30 Clock-Hours**

The Welding Inspection and Welding Metallurgy course introduces students to welding inspection and basic metallurgy. Students will gain a basic understanding of how metals behave during heating and cooling and the microscopic structure of metals and these effects on the weldability.

Objectives:

- Identify differences between ferrous and non-ferrous metals.
- Explain the effects of heat and cooling of metals.
- Demonstrate basic weld puddle dynamics.
- Explain various codes and standards.
- Identify common discontinuities and causes.

Projects **2 Credits/60 Clock-Hours**

This course covers production welding skills, fabrication, math, blueprint reading and other essential skills.

Objectives:

- Complete at least one welding project in each of the following processes:
  - GMAW.

- GTAW.
- SMAW.
- FCAW.

Related Equipment **2 Credits/60 Clock-Hours**

Students are taught how to use various pieces of equipment in the shop. Shears, bandsaws, iron workers, rollers, press brakes.

Objectives:

- Safely operate each of the following pieces of equipment:
  - Shear and iron worker.
  - Pipe/tubing bender.
  - Plate roller.
  - Bandsaw.
  - Press brake.

Endorsements **2 Credits/60 Clock-Hours**

This course will cover company-specific standards for Welding Procedure Specifications (WPS) and Procedure Qualification Record (PQR) endorsements.

Objectives:

- Obtain a company welding endorsement (WPS) in at least one of the following processes:
  - GMAW.
  - GTAW.
  - SMAW.
  - FCAW.
  - GMAW Pulse.

Industry Prep **1 Credit/30 Clock-Hours**

This course will cover basic welding terminology to include Welding Procedure Specifications (WPS), and Procedure Qualification Record (PQR). This course will explore tools and best practices for a successful job search and interview.

Objectives:

- Define welding terminology and certification processes.
- Interpret technical drawings and symbols.
- Demonstrate industry-specific job-seeking skills.

Metal Finishing **1 Credit/30 Clock-Hours**

This course will cover training and techniques in metal finishing principles such as, grinding, sanding, personal protective equipment and safety practices.

Objectives:

- Properly use personal protective equipment.
- Demonstrate proper safety practices.
- Demonstrate grinding and sanding techniques.

Salt Lake Community College

Welding Symbols and Print Reading **2 Credits/60 Clock-Hours**

This course teaches students to interpret prints and drawings including welding symbols used in the welding and fabrication industries. Engineering drawings are introduced as the medium by which the engineer, project manager, and/or draftsman communicates instructions to production welding personnel.

Objectives:

- Identify various American Welding Society (AWS) welding symbols.
- Identify basic line types used in mechanical drawings.
- Demonstrate basic sketching techniques and object representations.
- Create alternate views from existing views.
- Use drawing notes, specifications, title blocks, and bills of materials correctly.

Gas Metal Arc Welding (GMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in the practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection as necessary for GMAW proficiency. The pulsed-spray (GMAW-P) metal transfer mode will be introduced.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.

Flux Cored Arc Welding (FCAW) II **2 Credits/60 Clock-Hours**

This course expands student competency in hands-on uses and practical application of FCAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for FCAW proficiency.

Objectives:

- Describe the advantages and limitations of FCAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F and 3G welds with FCAW.
- Perform 4F and 4G welds with FCAW.

Oxy Fuel **1 Credit/30 Clock-Hours**

Learn practical skills using the oxy-acetylene welding process on carbon steel and understand Oxy-Acetylene equipment and flame adjustment. Upon completion of this course students have a better understanding of how to read and manipulate the weld puddle as related to other welding processes. Students will perform oxy-acetylene, fusion and braze welding.

Objectives:

- Demonstrate safe shop and process practices.
- Perform equipment set-up and proper flame adjustment.

- Demonstrate fusion welding on low carbon steel.
- Demonstrate braze welding on low carbon steel.

Shielded Metal Arc Welding (SMAW) III **2 Credits/60 Clock-Hours**

Continued practice in welding skills using the Shielded Metal Arc Welding process on carbon steel. Instruction in safe practices and theory of Shield Metal Arc Welding are continued. Introduction to welder performance qualification practical skills development in welding groove welds. Preparatory to and including welder qualification testing experience.

Objectives:

- Identify the technical terms of the V-groove open root welding joint.
- Demonstrate the ability to follow welding procedure specifications.
- Complete open root welds on plate.
- Execute practical weld tests and welder performance qualification.
- Critique welds to a quality standard.
- Perform 3G and 4G qualification tests.

Gas Metal Arc Welding (GMAW) III **2 Credits/60 Clock-Hours**

Continued practice in welding skills using the Gas Metal Arc Welding process on carbon steel. Instruction in safe practices and theory of Gas Metal Arc Welding are continued. Introduction to welder performance qualification practical skills development in welding groove welds. Preparatory to and including welder qualification testing experience.

Objectives:

- Identify the technical terms of the V-groove open root welding joint.
- Demonstrate the ability to follow welding procedure specifications.
- Complete open root welds on plate.
- Execute practical weld tests and welder performance qualification.
- Critique welds to a quality standard.
- Perform 3G and 4G qualification tests.

Flux Cored Arc Welding (FCAW) III **2 Credits/60 Clock-Hours**

Continued practice in welding skills using the Flux Cored Arc Welding process on carbon steel. Instruction in safe practices and theory of Flux Cored Arc Welding are continued. Introduction to welder performance qualification practical skills development in welding groove welds. Preparatory to and including welder qualification testing experience.

Objectives:

- Identify the technical terms of the V-groove open root welding joint.
- Demonstrate the ability to follow welding procedure specifications.
- Complete open root welds on plate.
- Execute practical weld tests and welder performance qualification.
- Critique welds to a quality standard.
- Perform 3G and 4G qualification tests.

Welding Inspection and Welding Metallurgy **1 Credit/30 Clock-Hours**

The Welding Inspection and Welding Metallurgy course introduces students to welding inspection and basic metallurgy. Students will gain a basic understanding of how metals behave during heating and cooling and the microscopic structure of metals and these effects on the weldability.

Objectives:

- Identify differences between ferrous and non-ferrous metals.
- Explain the effects of heat and cooling of metals.
- Demonstrate basic weld puddle dynamics.
- Explain various codes and standards.
- Identify common discontinuities and causes.

Welding Skill Practice I **1 Credits/30 Clock-Hours**

Welding Skill Practice continues to develop the skills gained in the welding program. You will work with the instructor to complete one or more projects that are applicable to the skills needed in the welding industry. You are expected to work independently as per expectations of a program completer in the industry.

Objectives:

- Complete projects using industry specific tasks to prepare for a specific company in industry.

Welding Skill Practice II **1 Credits/30 Clock-Hours**

Welding Skill Practice continues to develop the skills gained in the welding program. You will work with the instructor to complete one or more projects that are applicable to the skills needed in the welding industry. You are expected to work independently as per expectations of a program completer in the industry.

Objectives:

- Complete projects using industry specific tasks to prepare for a specific company in industry.

Welding Special Projects I **1 Credit/30 Clock-Hours**

Students will work with instructors to design and build an instructor approved project using Previously learned welding processes. Students must define a timeline with instructor, that will allow for the project to be completed on time, create a three-view blueprint with weld symbols, provide a cost estimate of materials and parts list, and pass inspection. Students must supply materials.

Objectives:

- Demonstrate the use of welding skills to create a project.
- Create blueprints.
- Define a timeline for completion.
- Create a cost estimate for materials.

Welding Special Projects II **1 Credit/30 Clock-Hours**

Students will work with instructors to design and build an instructor approved project using Previously learned welding processes. Students must define a timeline with instructor, that will allow for the project to be completed on time, create a three-view blueprint with weld symbols, provide a cost estimate of materials and parts list, and pass inspection. Students must supply materials.

Objectives:

- Demonstrate the use of welding skills to create a project.
- Create blueprints.
- Define a timeline for completion.
- Create a cost estimate for materials.

Snow College

Welding Symbols and Print Reading **2 Credits/60 Clock-Hours**

This course teaches students to interpret prints and drawings including welding symbols used in the welding and fabrication industries. Engineering drawings are introduced as the medium by which the engineer, project manager, and/or draftsman communicates instructions to production welding personnel.

Objectives:

- Identify various American Welding Society (AWS) welding symbols.
- Identify basic line types used in mechanical drawings.
- Demonstrate basic sketching techniques and object representations.
- Create alternate views from existing views.
- Use drawing notes, specifications, title blocks, and bills of materials correctly.

Gas Metal Arc Welding (GMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in the practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection as necessary for GMAW proficiency. The pulsed-spray (GMAW-P) metal transfer mode will be introduced.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.

Flux Cored Arc Welding (FCAW) II **2 Credits/60 Clock-Hours**

This course expands student competency in hands-on uses and practical application of FCAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for FCAW proficiency.

Objectives:

- Describe the advantages and limitations of FCAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F and 3G welds with FCAW.
- Perform 4F and 4G welds with FCAW.

Specialized Shielded Metal Arc Welding (SMAW) I **3 Credit/90 Clock-Hours**

The Specialized Shielded Metal Arc Welding (SMAW) I course teaches intermediate skills in the SMAW process, with an emphasis on joints applying to structural and pipe applications in multiple positions. Students are introduced to advanced welding skills on heavy plate and mild steel pipe.
This course expands students' competency in hands-on uses and practical application of SMAW. Students learn to reason through appropriate parameters necessary to achieve proficiency in SMAW with open root welds and multi pass welds. Students demonstrate fillets and grooves with E6010 and E7018 electrodes.

Objectives:

- Identify the technical terminology.
- Demonstrate proper preparation and tacking techniques for plate and pipe coupons.
- Demonstrate proper technique utilized in multi-pass welds.
- Complete welds on plate.
- Complete welds on pipe.

Specialized Shielded Metal Arc Welding (SMAW) II **3 Credit/90 Clock-Hours**

The Specialized Shielded Metal Arc Welding (SMAW) II course teaches advanced skills in the SMAW process, with an emphasis on joints applying to field applications. Students refine and demonstrate advanced welding skills on heavy plate or mild steel pipe.
This course expands students' competency in hands-on uses and practical application of SMAW. Students learn to reason through appropriate parameters necessary to achieve proficiency in SMAW with open root welds and structural steel multi pass welds. Students demonstrate fillets and grooves with E6010 and E7018 electrodes.

Objectives:

- Utilize the technical terminology.
- Demonstrate proper preparation and tacking techniques for plate and pipe coupons.
- Demonstrate proper technique utilized in multi-pass welds.
- Complete welds on plate or pipe.

Specialized Gas Tungsten Arc Welding (GTAW) I **3 Credit/90 Clock-Hours**

Specialized Gas Tungsten Arc Welding I is an Intermediate level course for welding students. This course expands students experience with differing machine parameters and various materials.

Objectives:

- Perform welds on various metals.
- Perform welds on multiple material thicknesses.
- Perform welds in out of position scenarios.

Specialized Gas Tungsten Arc Welding (GTAW) II **3 Credits/90 Clock-Hours**

Specialized Gas Tungsten Arc Welding (GTAW) II course expands student competency in hands-on uses and practical application of GTAW using various metals with an emphasis on precision work. Students learn appropriate parameter selection for welding procedure requirements as necessary for GTAW proficiency.

Objectives:

- Describe the advantages and limitations of GTAW.
- Select proper electrode classifications for their appropriate applications.

- Describe electrode classifications along with the appropriate uses and tip configurations.
- Perform multiple welds with GTAW.
- Perform welds on varying material thicknesses.

Specialized Gas Metal Arc Welding (GMAW) I **3 Credit/90 Clock-Hours**

The Specialized Gas Metal Arc Welding (GMAW) I is an intermediate course that teaches students the special challenges that various materials, joint types and positions to welders. Students practice welding on these metals by welding in various joints and positions.

Objectives:

- Explain the characteristics of aluminum and stainless steel and the steps required to weld these metals successfully.
- Set up equipment correctly for welding aluminum and stainless steel.
- Prepare aluminum and stainless steel correctly.
- Complete groove welds on aluminum and stainless steel.
- Complete fillet welds on aluminum and stainless.

Specialized Gas Metal Arc Welding (GMAW) II **3 Credit/90 Clock-Hours**

The Specialized Gas Metal Arc Welding (GMAW) II is an advanced course that emphasizes on processes and applications pertaining to a manufacturing environment. Students gain experience working with various materials, joint types and positions. Students practice welding on these metals by welding in various joints and positions.

Objectives:

- Explain the characteristics of aluminum and stainless steel and the steps required to weld these metals successfully.
- Set up equipment correctly for welding aluminum and stainless steel.
- Prepare aluminum and stainless steel correctly.
- Complete groove welds on aluminum and stainless steel.
- Complete fillet welds on aluminum and stainless.

Specialized Flux Cored Arc Welding (FCAW) I **3 Credit/90 Clock-Hours**

This intermediate course expands students experience with FCAW welding proceses utilizing various joint types and positions.

Objectives:

- Weld various joints and material thicknesses.
- Understand application and limitations of FCAW processes.

Specialized Flux Cored Arc Welding (FCAW) II **3 Credit/90 Clock-Hours**

This Advanced course will allow students to expand their experience in FCAW processes pertaining to an industrial application.

Objectives:

- Perform multipass welds.
- Perform qualification tests.
- Understand application and limitations of FCAW processes.

Metal Fabrication I **3 Credits/90 Clock-Hours**

The Metal Fabrication I course teaches student to take a project from concept to completed part. Students will design, cut, form and weld projects utilizing various equipment and welding processes.

Objectives:

- Demonstrate basic design and dimensioning.
- Develop a written project plan.
- Outline equipment and processes.
- Calculate cost and material required.
- Use various equipment to fabricate a metal project.

Metal Fabrication II **3 Credits/90 Clock-Hours**

The Metal Fabrication II course builds from principles learned in Metal Fabrication II and allows student to further develop skills to take a project from concept to completed part in order to prepare them for a Fabrication environment. Students will design, cut, form and weld projects utilizing various equipment and welding processes.

Objectives:

- Demonstrate basic design and dimensioning.
- Develop a written project plan.
- Outline equipment and processes.
- Calculate cost and material required.
- Use various equipment to fabricate a metal project.

Welding Inspection and Testing **3 Credit/90 Clock-Hours**

The Welding Inspection and Testing course introduces students to welding inspection and Weld testing. Students will gain a basic understanding of AWS standards and visual inspection techniques. Student will practice common destructive testing methods.

Objectives:

- Explain methods of non-destructive inspection.
- Demonstrate basic weld inspection and testing.
- Explain various codes and standards.
- Identify common discontinuities and causes.

Southwest Technical College

Inspection, Metallurgy, and Blueprints **2 Credits/60 Clock-Hours**

This course will introduce students to welding symbols and blueprints that welding professionals use. Discussing different welding processes and materials that can be welded. Basic AWS standards and types of nondestructive testing (NDT) and destructive testing will be covered.

Objectives:

- Discuss codes, standards, and types of nondestructive and destructive testing.
- Identify and interpret basic AWS standardized welding symbols, blueprints, and bill of materials.
- Identify parts of a joint, parts of a weld, and how they correspond with blueprints.
- Identify and state various stresses a weld can be subjected to.

- Explain welder qualifications, certification, and welding procedure specifications (WPS).

Flux Cored Arc Welding Gas Shielded: AWS Certification Preparation **1 Credit/30 Clock-Hours**

In this course, students will use the knowledge gained in previous courses to pass an AWS welder qualification. Instructors will guide students through the intricacies of the AWS D1.1 welder qualification requirements, emphasizing the practical application of welding principles.

Objectives:

- Analyze a Welding Procedure Specification by reading and interpreting its contents.
- Explain the visual acceptance requirements outlined in the AWS D1.1 code.
- Execute welds within the defined parameters stated in the welding procedure specification (WPS).
- Complete the necessary steps to successfully pass the FCAW-G AWS test according to the AWS D1.1 code.

Gas Metal Arc Welding (GMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in the practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection as necessary for GMAW proficiency. The pulsed-spray (GMAW-P) metal transfer mode will be introduced.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.

Welding Skill Practice **1 Credit/30 Clock-Hours**

In this course, students will further refine skills previously acquired in the program. Working with an instructor, they will perform projects similar to what is found in industry. This course emphasizes independent work, reflecting the expectations placed on industry professionals.

Objectives:

- Evaluate and select specific skills to develop further.
- Apply acquired skills and knowledge through hands-on welding exercises, fostering practical expertise.
- Demonstrate welding techniques under the supervision of experienced instructors, ensuring proficiency.
- Employ effective time management strategies to achieve the desired skill level within the allotted course duration.

Fabrication Tools **1 Credit/30 Clock-Hours**

This course introduces students to common place power and hand tools used for fabrication on welding shops. It will give students the knowledge they need to use these tools and the confidence to operate this equipment.

Objectives:

- Demonstrate correct use of hand tools.

- Perform mechanical cutting operations to specified requirements.
- Perform grinding and finishing operations.
- Execute basic bending tasks to dimensional standards.
- Complete a final project to assess mastery of all competencies as components of a whole outcome.

Advanced Thermal Cutting and Brazing **2 Credits/60 Clock-Hours**

This course continues with oxygen and fuel gas (oxy fuel) cutting and brazing systems as well as Carbon Arc Cutting and Plasma Arc Cutting systems, specifically safety. Students will continue to practice oxy fuel cutting.

Objectives:

- Perform safety inspection of equipment and accessories and proper set up and shut down techniques.
- Utilize charts to identify proper tip selection and gas working pressures.
- Demonstrate carburizing, neutral, and oxidizing flames.
- Identify the basic components, safety concerns, and properly set up Carbon Arc Cutting (CAC).
- Identify the basic components, safety concerns, and properly set up Plasma Arc Cutting (PAC) power source.

Tooele Technical College

Inspection, Metallurgy, and Blueprints **2 Credits/60 Clock-Hours**

This course will introduce students to welding symbols and blueprints that welding professionals use. Discussing different welding processes and materials that can be welded. Basic AWS standards and types of nondestructive testing (NDT) and destructive testing will be covered.

Objectives:

- Discuss codes, standards, and types of nondestructive and destructive testing.
- Identify and interpret basic AWS standardized welding symbols, blueprints, and bill of materials.
- Identify parts of a joint, parts of a weld, and how they correspond with blueprints.
- Identify and state various stresses a weld can be subjected to.
- Explain welder qualifications, certification, and welding procedure specifications (WPS).

Flux Cored Arc Welding Gas Shielded: AWS Certification Preparation **1 Credit/30 Clock-Hours**

In this course, students will use the knowledge gained in previous courses to pass an AWS welder qualification. Instructors will guide students through the intricacies of the AWS D1.1 welder qualification requirements, emphasizing the practical application of welding principles.

Objectives:

- Analyze a Welding Procedure Specification by reading and interpreting its contents.
- Explain the visual acceptance requirements outlined in the AWS D1.1 code.
- Execute welds within the defined parameters stated in the welding procedure specification (WPS).
- Complete the necessary steps to successfully pass the FCAW-G AWS test according to the AWS D1.1 code.

Aluminum Gas Metal Arc Welding **1 Credit/30 Clock-Hours**

This course teaches Aluminum Gas Metal Arc Welding. Students explore how to weld aluminum using the Gas Metal Arc Welding (GMAW) Process. Throughout this course, you will analyze aluminum alloys, elements, temper designations, filler metal selections, and preparation of base metals.

Objectives:

- Demonstrate safety and best practices when operating aluminum GMAW.
- Perform fillet welds 1F, 2F, and 3F positions.

Basic CNC Cutting and Operation **1 Credit/30 Clock-Hours**

This course teaches the basic operations of CNC cutting systems. Students will learn CNC safety and basic operation of CNC cutting systems.

Objectives:

- Demonstrate safety and best practices when operating CNC cutting systems.
- Demonstrate proper set-up and operation of the CNC cutting system.
- Identify the X, Y, and Z axis.
- Perform basic cuts using the CNC cutting system.

Advanced CNC Cutting and Operation **2 Credits/60 Clock-Hours**

This course teaches advanced CNC cutting system operations. Students will learn CNC programing and design. Students will program and cut a detailed image using the CNC cutting system.

Objectives:

- Perform basic shape programming.
- Perform complex shape programming.
- Perform image conversion to a DXF file.
- Perform DXF file import and export.
- Perform complex image cuts using the CNC cutting system.

Basic Sheet Metal Welding **2 Credits/60 Clock-Hours**

This course teaches student competency in hands-on uses and practical application for GMAW-S welding on sheet metal. Students learn appropriate parameter selection for welding sheet metal proficiency.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given material thickness.
- Describe shielding gas flow rates, composition, and selection.
- Perform 2F, 3F, corner joints, and lap joints on ferrous sheet metal.

Basic Sheet Metal Fabrication **1 Credit/30 Clock-Hours**

This course teaches student competency in hands-on and practical application for sheet metal fabrication. Students learn appropriate methods of cutting and forming basic sheet metal parts.

Objectives:

- Demonstrate safety and best practices when working with sheet metal.
- Demonstrate proper set-up and operation of the manual sheer, and hand tools for sheet metal cutting and shaping.

- Demonstrate proper set-up and operation of the box and pan brake.
- Perform accurate cuts using the manual sheer and hand tools.
- Perform accurate bends using the box and pan brake.

Advanced Sheet Metal Fabrication **1 Credit/30 Clock-Hours**

This course expands student competency in hands-on and practical application for sheet metal fabrication. Students demonstrate the competency to cut, shape/form and join complex sheet metal shapes.

Objectives:

- Demonstrate safety and best practices when operating sheet metal tools.
- Demonstrate proper set-up and operation of the bead roller and shrinker/stretcher.
- Perform accurate shapes using the bead roller adding rigidity to sheet metal.
- Perform accurate curves, convex and concave using the shrinker/stretcher.
- Build a tool tray following a provided blueprint.

Basic Tube Notching and Welding **1 Credit/30 Clock-Hours**

This course teaches the basics of tube notching and welding. Students will set up a tube notcher for various notching angles. Students will be able to join tubes using various welding systems.

Objectives:

- Demonstrate safety and best practices when operating the tube notcher.
- Perform tube notching resulting in various angles.
- Perform welds on prepped joints 1F, 2F, and 3F positions.

FCAW Self-Shielded Welding **2 Credits/60 Clock-Hours**

This course teaches student competency in hands-on and practical application of the Flux Core Arc Welding (FCAW) self- shielded welding process. Students will learn the basic setup and operation of the FCAW self-shielded process. Using the FCAW self-shielded process, students will also be taught how to weld in the flat, horizontal, vertical, positions.

Objectives:

- Demonstrate safety and best practices when operating FCAW self-shielded welding.
- Demonstrate proper set-up and operation of the FCAW self-shielded equipment.
- Perform 1F, 2F, and 3F welds on ferrous metals.
- Perform 1G, and 2G welds on ferrous metals.

Welding Inspection and Welding Metallurgy **1 Credit/30 Clock-Hours**

The Welding Inspection and Welding Metallurgy course introduces students to welding inspection and basic metallurgy. Students will gain a basic understanding of how metals behave during heating and cooling and the microscopic structure of metals and these effects on the weldability.

Objectives:

- Identify differences between ferrous and non-ferrous metals.
- Explain the effects of heat and cooling of metals.
- Demonstrate basic weld puddle dynamics.
- Explain various codes and standards.
- Identify common discontinuities and causes.

Machining for Welders **2 Credits/60 Clock-Hours**

Machining for Welders will cover the basic procedures to run a knee mill in the machine shop. During this course, students will study topics essential to knee mill operations, including setting tool offsets, drilling tapping, stalk removal using an end mill, and squaring stalk.

Objectives:

- Demonstrate safety and best practices when operating the knee mill.
- Demonstrate the use of precision measurement equipment.
- Demonstrate basic blueprint reading and drawing, including tolerances.
- Identify various threads and their classifications.
- Demonstrate tapping and drilling operations.

Welding Sculpture I **2 Credits/60 Clock-Hours**

Welding Sculpture I provides the opportunity to work with instructors to design and build a welding sculpture. Throughout this course, you will use ferrous and Non-Ferrous metals. The sculpture you design must be an original, creative artwork. You may use all welding processes to create your sculpture. You will also document the creation of the sculpture in a notebook with pictures, receipts for materials, concept sketches and anything done in the creation of the sculpture.

Objectives:

- Use ferrous and non-ferrous metals to create a sculpture of artwork for SkillsUSA competition.
- Use various welding processes learned to create the sculpture.

Welding Sculpture II **2 Credits/60 Clock-Hours**

Welding Sculpture II offers additional time for completing the welding sculpture started in the Welding Sculpture I course. You will need to continue documenting the creation of the sculpture in a notebook with pictures, receipts for materials, concept sketches, and anything done in the creation of the sculpture.

Objectives:

- Complete the welding sculpture.
- Create documentation of the project, complete with pictures, receipts, and sketches.

Welding Skill Practice **1 Credit/30 Clock-Hours**

In this course, students will further refine skills previously acquired in the program. Working with an instructor, they will perform projects similar to what is found in industry. This course emphasizes independent work, reflecting the expectations placed on industry professionals.

Objectives:

- Evaluate and select specific skills to develop further.
- Apply acquired skills and knowledge through hands-on welding exercises, fostering practical expertise.
- Demonstrate welding techniques under the supervision of experienced instructors, ensuring proficiency.
- Employ effective time management strategies to achieve the desired skill level within the allotted course duration.

Welding Skill Practice II **2 Credits/60 Clock-Hours**

Welding Skill Practice II continues to develop the skills gained in the welding program. You will work with the instructor to complete one or more projects that are applicable to the skills needed in the welding industry. You are expected to work independently as per expectations of a program completer in the industry.

Objectives:

- Complete projects using industry specific tasks to prepare for a specific company in industry.

Welding Special Projects **2 Credits/60 Clock-Hours**

Students in this course will work with instructors to design and build an instructor approved project using Shielded Metal Arc Welding (SMAW), Flux Core Arc Welding (FCAW), Gas Metal Arc Welding (GMAW), or Gas Tungsten Arc Welding (GTAW) process. Students must define a timeline that will allow for the project to be completed on time, create a three-view blueprint with weld symbols, provide a cost estimate of materials and parts list, build the project to American Welding Society (AWS) Standards, and pass inspection. Student projects must not exceed course time.

Objectives:

- Demonstrate the use of welding skills to create a project.
- Create blueprints.
- Define a timeline for completion.
- Create a cost estimate for materials.

Weld Test/Job Preparation **1 Credit/30 Clock-Hours**

This course will provide time for students to practice for a job interview/weld test.

Objectives:

- Practice for a job specific weld test.

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Welding Symbols and Print Reading **2 Credits/60 Clock-Hours**

This course teaches students to interpret prints and drawings including welding symbols used in the welding and fabrication industries. Engineering drawings are introduced as the medium by which the engineer, project manager, and/or draftsman communicates instructions to production welding personnel.

Objectives:

- Identify various American Welding Society (AWS) welding symbols.
- Identify basic line types used in mechanical drawings.
- Demonstrate basic sketching techniques and object representations.
- Create alternate views from existing views.
- Use drawing notes, specifications, title blocks, and bills of materials correctly.

Gas Metal Arc Welding (GMAW) II **2 Credits/60 Clock-Hours**

This course expands students' competency in the practical application of GMAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter

selection as necessary for GMAW proficiency. The pulsed-spray (GMAW-P) metal transfer mode will be introduced.

Objectives:

- Describe the advantages and limitations of GMAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F, 3G, 4F, and 4G welds with GMAW-S.
- Perform fillets and groove joints with GMAW-P.

Flux Cored Arc Welding (FCAW) II **2 Credits/60 Clock-Hours**

This course expands student competency in hands-on uses and practical application of FCAW. Shielding gas composition, selection, and appropriate flow rates are discussed. Students learn appropriate parameter selection for welding procedure requirements as necessary for FCAW proficiency.

Objectives:

- Describe the advantages and limitations of FCAW.
- Select proper equipment and parameters given welding procedure requirements.
- Describe shielding gas flow rates, composition, and selection.
- Perform 3F and 3G welds with FCAW.
- Perform 4F and 4G welds with FCAW.

Gas Metal Arc Welding (GMAW) and Flux-Cored Arc Welding (FCAW) Theory
2 Credits/60 Clock-Hours

This is a GMAW and FCAW welding theory course. Students develop in-depth theoretical knowledge of the GMAW and FCAW processes including definitions, advantages, limitations, electrode classifications, power sources, causes and solutions for GMAW and FCAW discontinuities, and process troubleshooting.

Objectives:

- Define the Gas Metal Arc Welding (GMAW) process in detail.
- Define the Flux Cored Arc Welding (FCAW) process in detail.
- Identify GMAW and FCAW process fundamentals and principles of operation.
- Become familiar with the equipment and torch components necessary for GMAW and FCAW, including wire feeders, drive rolls, contact tips, gas diffusers, and nozzles.
- Demonstrate an understanding of GMAW and FCAW electrodes including appropriate uses, common sizes, manufacturing standards, and electrode classification in accordance with the most current AWS standards.
- Demonstrate an understanding of constant-voltage volt-amp response curves commonly used for GMAW and FCAW.
- Define the various effects of voltage, current, arc length, wire feed speed, electrode manipulation, work angle, and travel angle on a molten weld pool using GMAW and FCAW.
- Identify and explain metal transfer modes, including short-circuiting, globular, and axial spray.
- Become familiar with pulsed-waveform transfer modes and their appropriate uses.
- Identify and explain the FCAW-G and FCAW-S variations of FCAW.
- Demonstrate an understanding of GMAW shielding requirements, including appropriate shielding gasses, commonly used binary gas mixtures, appropriate flow rates, flowmeters, and regulators.
- Identify weld discontinuities common to GMAW and FCAW, and develop strategies to minimize, eliminate, and/or repair them.

Gas Tungsten Arc Welding (GTAW) Theory **2 Credits/60 Clock-Hours**

This is a GTAW-specific welding theory course. Students will develop in-depth theoretical knowledge of the GTAW process including definitions, process advantages and limitations, electrode types and classifications, GTAW power sources, causes and solutions for GTAW discontinuities, and process troubleshooting.

Objectives:

- Define the Gas Tungsten Arc Welding (GTAW) process in detail.
- Identify GTAW process fundamentals.
- Become familiar with the equipment and torch components necessary for GTAW including collets, collet bodies, gas lenses, nozzles, and electrodes.
- Demonstrate a thorough understanding of polarity, including: the ability to select the correct polarity based on welding application, advantages and limitations of each polarity type, and how polarity affects electrode current capacity.
- Identify GTAW process advantages and limitations.
- Demonstrate an understanding of GTAW electrodes including appropriate uses, tip geometries, sizing based on polarity and current, how tip geometry affects the weld pool, grinding techniques, and electrode classifications in accordance with the most current AWS standards.
- Demonstrate an understanding of constant-current volt-amp response curves commonly used for GTAW.
- Define the various affects of current, arc length, electrode manipulation, work angle, and travel angle on a molten weld pool using GTAW.
- Identify arc-initiation techniques.
- Demonstrate an understanding of GTAW shielding requirements including appropriate shielding gasses, appropriate flow rates, lamellar flow, and purging.
- Identify weld discontinuities common to GTAW, and develop strategies to minimize, eliminate, and/or repair them.

Shielded Metal Arc Welding (SMAW) Theory **2 Credits/60 Clock-Hours**

This is a SMAW-specific welding theory course. Students will develop in-depth theoretical knowledge of the SMAW process including definitions, process advantages and limitations, electrode types and classifications, SMAW power sources, causes and solutions for SMAW discontinuities, and process troubleshooting.

Objectives:

- Define the Shielded Metal Arc Welding (SMAW) process in detail.
- Identify SMAW process fundamentals.
- Identify SMAW process advantages and limitations.
- Demonstrate an understanding of SMAW electrodes including appropriate uses, types of flux coatings, how electrodes function, slag formation, and electrode classifications in accordance with the most current AWS standards.
- Define SMAW principles of operation.
- Demonstrate an understanding of constant-current volt-amp response curves commonly used for SMAW.
- Define the various affects of current, arc length, electrode manipulation, work angle, and travel angle on a molten weld pool using SMAW.
- Demonstrate an understanding of SMAW's shielding sources.

- Demonstrate an understanding of polarity, duty-cycle, and open-circuit voltage as they pertain to SMAW.
- Identify common causes and solutions to arc blow.
- Demonstrate an understanding of surfacing welds and their applications including cladding, buildup, hard-facing, and buttering.

Advanced Shielded Metal Arc Welding (SMAW) **5 Credits/150 Clock-Hours**

This course instructs advanced techniques for full-penetration welds in open-root configurations and with backing. Instruction emphasizes preparing students for performance qualification. Lecture includes SMAW theory review, electrical concepts, and welding power sources including motor-generator, engine-generator, inverter, transformer-rectifier, and AC transformer.

Objectives:

- Demonstrate an understanding of welding shop safety. Students must pass the program-standard safety exam with a minimum 80% prior to participating in lab activities.
- Develop a thorough understanding of welding-specific electrical concepts including duty cycles, welding polarities, open-circuit voltage, alternating current versus direct current output, and constant current versus constant voltage volt-amp response curves.
- Identify the common welding power-source types including motor-generator, engine-generator, inverter, transformer-rectifier, and AC transformer. Describe the advantages, limitations, and common/appropriate uses for each.
- Describe and demonstrate an understanding of the electrode classification system specified by the most current AWS specification for low-alloy SMAW electrodes.
- Demonstrate the ability to prepare bend-test specimen in accordance with AWS qualification standards.
- Perform full-penetration groove welds on plate, with backing, using E7018 electrodes in the flat, horizontal, vertical, and overhead positions. A minimum of one plate in each position listed will be assigned and validated using bend-testing (two side-bends each).
- Perform full-penetration groove welds on plate, without backing (open-root), using E6010 and E7018 electrodes in the flat, horizontal, vertical, and overhead positions. A minimum of one plate in each position listed will be assigned and validated using bend-testing (two side-bends each).
- Demonstrate an ability to tack open-root pipe joints appropriately in accordance with industry standards to ensure full-penetration root passes on open-root pipe groove welds.
- Perform full-penetration groove welds on pipe in the open-root configuration in the 1G, 2G, 5G, and 6G positions. A minimum of one pipe coupon, with an outside diameter not less than 6”, in each position listed is required.
- Perform a performance qualification test in the 3G position utilizing an AWS Standard WPS (SWPS).
- Demonstrate an ability to use mechanized OFC equipment to perform straight cuts and bevels (utilizing a track torch), and orbital/circumferential cuts on pipe (pipe beveller).

Advanced Gas Metal Arc Welding (GMAW) and Flux-Cored Arc Welding (FCAW)
5 Credits/150 Clock-Hours

This course will instruct students on advanced techniques for full-penetration welds in open-root configurations and with backing. Instruction emphasizes preparing students for performance qualification. The lecture includes a theory review, the weldability of commonly welded metals, and cost-effective welding principles.

Objectives:

- Demonstrate an understanding of welding shop safety. Students must pass the program-standard safety exam with a minimum 80% prior to participating in lab activities.
- Develop an understanding of the factors that affect welding costs, including: weldability, joint geometries, welding process, electrode and operator efficiencies, and welding procedure-mandated requirements such as post-weld heat treatments (PWHT).
- Calculate costs of weldments using real world examples.
- Develop an understanding of how automated and mechanized welding applications reduce weld costs.
- Identify common industry practices that increase overall welding costs and develop strategies to mitigate or eliminate those factors.
- Perform full-penetration groove welds on plate, with backing, in the 1G, 2G, 3G, and 4G positions using both GMAW-P and FCAW-G. A variety of at least four plates, with a minimum plate thickness of 3/8”, of the configurations listed will be assigned and validated using bend-testing (two side-bends each).
- Perform full-penetration groove welds on plate, without backing (open-root configuration), in the 1G, 2G, 3G, and 4G positions using GMAW-S for the root pass and GMAW-P or FCAW-G for the fill and cap passes. A minimum one plate in each position listed will, with a minimum plate thickness of 3/8”, will be assigned and validated using bend-testing (two side-bends each).
- Perform a full-penetration v-groove with backing using FCAW-G on material not less than 1” and validate acceptability using visual inspection and bend-testing (two side-bends required).
- Perform a full-penetration v-groove with backing using GMAW-P on material not less than 1” and validate acceptability using visual inspection bend-testing (two side-bends required).
- Demonstrate an ability to tack open-root pipe joints appropriately in accordance with industry standards to ensure full-penetration root passes on open-root pipe groove welds.
- Demonstrate the ability to prepare bend-test specimen in accordance with AWS standards.
- Perform full-penetration groove welds on pipe in the open root-configuration in the 1G, 2G, 5G, and 6G positions. At least one pipe, with an outside diameter not less than 6”, in each position listed is required.
- Perform a performance qualification test in the 3G position utilizing an AWS Standard WPS (SWPS).
- Perform GMAW welds on aluminum base material in the 1F/G and 2F/G positions.
- Perform mechanized or automated GMAW welding.

Related Welding Processes **5 Credits/150 Clock-Hours**

This course instructs students in advanced fusion joining and brazing. Submerged-arc welding, laser welding, resistance welding, metal forming, brazing, soldering, and CNC cutting will be studied and performed. Theory instruction on electron beam welding and explosion welding will be included.

Objectives:

- Demonstrate an understanding of welding shop safety. Students must pass the program-standard safety exam with a minimum 80% prior to participating in lab activities.
- Demonstrate an ability to perform submerged-arc welding (SAW). One v-groove weld with backing, using plate with a minimum thickness of 1”, and validated using bend testing (two side bends) is required.
- Demonstrate an ability to perform resistance spot welding (RSW).
- Demonstrate an ability to perform stud welding (SW).
- Demonstrate an ability to perform manual brazing and induction brazing.
- Demonstrate an ability to perform soldering.

- Demonstrate an ability to perform laser beam welding (LBW).
- Demonstrate an ability to perform CNC thermal cutting.
- Demonstrate an ability to perform forging.
- Identify the advantages and limitations of SAW, RSW, SW, brazing, soldering, LBW, CNC thermal cutting, and forging.
- Identify essential variables of SAW, RSW, SW, brazing, soldering, LBW, CNC thermal cutting, and forging.
- Describe appropriate industrial applications for SAW, RSW, SW, brazing, soldering, LBW, CNC thermal cutting, and forging.

Advanced Gas Tungsten Arc Welding (GTAW) **5 Credits/150 Clock-Hours**

This course instructs students in advanced GTAW uses and applications such as welding titanium, copper, and GTAW brazing. Students perform welds using advanced power source features on inverter-type power sources. Students perform welds using rotary positioners, back-purges, and fixtures.

Objectives:

- Demonstrate an understanding of welding shop safety. Students must pass the program-standard safety exam with a minimum 80% prior to participating in lab activities.
- Demonstrate an ability to describe, assemble/disassemble, and troubleshoot GTAW torch components including collets, collet-bodies, gas lenses, and nozzles.
- Demonstrate an ability to correctly size gas lenses and nozzles in accordance with shielding requirements based on welding application.
- Identify the advantages and limitations of gas-cooled and water-cooled GTAW torches
- Demonstrate an understanding of welding polarity and describe the proper applications for each polarity type as they apply to GTAW.
- Describe how polarity affects electrode selection and current capacity.
- Describe, in detail, the most current AWS standard for GTAW electrodes, their proper applications, appropriate tip configurations, and correct grinding techniques.
- Describe the proper selection of shielding gasses, correct shielding gas flow rates, and backing-shields, trailing-shields, and purging techniques.
- Describe the differences and appropriate uses of the most common arc-initiation techniques, including high-frequency, lift-arc, and pilot arc.
- Perform GTAW welds utilizing a pulsed waveform on an inverter-type power supply.
- Utilize GTAW to perform full-penetration groove welds, with backing and in open-root configurations, on steel, stainless steel, and aluminum.
- Utilize GTAW to perform welds on titanium.
- Utilize GTAW to perform welds on copper.
- Perform GTAW brazing using silicon-bronze filler metal.
- Perform full-penetration groove welds using fixtures and back-purges on stainless steel.
- Perform circumferential welds on pipe utilizing GTAW and a rotary positioner.
- Perform full-penetration groove welds on stainless pipe or tubing with a minimum diameter of 1.5”.
- Interpret and demonstrate an ability to correctly utilize an AWS Standard WPS (SWPS).
- Perform a performance qualification test in the 3G position utilizing an AWS Standard WPS (SWPS).

Advanced Pipe Welding **5 Credits/150 Clock-Hours**

An advanced course for students who will pursue a career in petroleum pipeline welding. Pipe layout, fitting, and welding techniques will be taught extensively. Students will also learn proper use of pipeline-specific welding and cutting equipment, and industry-specific testing methods.

Objectives:

- Become familiar with the safety aspects associated with pipe welding and general fabrication shop safety issues. Each student must complete a written safety test, at 80% or above, before being allowed to work in the shop.
- Demonstrate competency in downhill pipe welding techniques using SMAW with a variety of electrode classifications and diameters.
- Perform full-penetration groove welds on pipe, with a minimum diameter of 20”, in the 5G position.
- Demonstrate pipe-welding competency using GTAW, GMAW, and FCAW.
- Demonstrate the ability to lay out, flame-cut, prepare, tack, and weld a pipe branch using pipe with a minimum diameter of 8”.
- Demonstrate a hands-on ability to properly layout, fit-up, and prepare open-root pipe joints for welding with various processes in the 1G, 2G, 5G, and 6G positions.
- Demonstrate the ability to use OFC pipe beveling equipment to prepare beveled pipe grooves on pipe with a minimum diameter of 12”.
- Be familiar with current industry trends and best practices in the specific field of pipe welding.
- Demonstrate an ability to pass industry-specific testing criteria for pipe welding employment.

Professional Vocational Leadership **2 Credits/60 Clock-Hours**

This course facilities student participation in SkillsUSA welding competitions. SkillsUSA goals and objectives will be discussed. Students will learn common strategies and skills necessary for successful participation in the SkillsUSA Welding, Welding Fabrication, and Welding Sculpture contests.

Objectives:

- Become familiar with the SkillsUSA vocational leadership program.
- Become a student member of SkillsUSA.
- Develop an understanding of the SkillsUSA philosophy beyond the scope of competitions.
- Develop an understanding of practical welding competition practices including print reading conformity, WPS conformity, scoring criteria, judging procedures, and project order of assembly.
- Identify competition best-practices utilizing contest scoring criteria as a guiding principle.
- Develop an understanding of how welding contests are organized, facilitated, and administered.
- Demonstrate the ability to use the skills learned in the class to participate in multiple mock-welding contests amongst the entire class.

Welding Sculpture **3 Credits/90 Clock-Hours**

A project-based course designed to introduce students to artistic and sculptural welding. Oxy-fuel cutting and plasma cutting for sculptural welding applications will be taught, as well as forging. We will also explore art theory, including elements and principles of design.

Objectives:

- Demonstrate proficiency in oxy-fuel cutting and plasma-arc cutting.
- Develop a basic knowledge of forging.

- Demonstrate knowledge in principles and elements of design and implement them in your projects.
- Become familiar with the safety aspects associated with welding and general fabrication shop safety issues. Each student must complete a written safety test, at 80% or above, before being allowed to work in the shop.
- Demonstrate ability to use equipment setup, welding technique on steel, and bending, cutting, and shaping metal using a variety of methods in order to create artistic sculptures.
- Demonstrate competency in material preparation and finishing (grinding, sanding, oxidizing for aesthetic purposes, clear coating).
- Demonstrate an ability to design and sketch a project, create a written plan, and weld a sculptural project to fit the requirements of a rubric.
- Learn how to source materials for projects in a sustainable and cost-effective way.

Practical Fabrication and Layout **5 Credits/150 Clock-Hours**

Students will propose and fabricate projects of their own design. Instructional emphasis will also include project planning, material procurement, and effective time management as it relates to fabrication. Students will gain experience utilizing a variety of fabrication tools and equipment.

Objectives:

- Demonstrate essential fabrication techniques including measuring, squaring, clamping, layout, and fixturing during the process of project completion.
- Demonstrate an ability to thoroughly brainstorm, plan, create sketches/prints, propose, and fabricate a welded project to completion.
- Demonstrate an ability to utilize arc welding and thermal cutting equipment during fabrication.
- Utilize a variety of common fabrication tools and equipment to complete fabricated projects including bandsaws, drill presses, angle grinders, bench grinders, ironworkers, press-brakes, and common fabrication hand tools.
- Demonstrate effective distortion control techniques during fabrication.
- Identify common structural shapes utilized in fabrication.
- Become familiar with common material identification methods including magnetism, spark testing, and others.
- Become familiar with appropriate practice for performing weld repairs on vehicles and vehicle frames.
- Create and/or revise a professional resume and cover-letter in accordance with welding industry recommended practices.

Weld Inspection **3 Credits/90 Clock-Hours**

This course introduces students to the requirements, skills, and fundamental knowledge required to become a welding inspector. Critical emphasis will be preparation for students to eventually take the Certified Welding Inspector (CWI) exam through the American Welding Society (AWS).

Objectives:

- Demonstrate a thorough understanding of the expectations, necessary professional qualifications, and responsibilities of a CWI.
- Identify basic welding-specific codes, specifications, standards, and their appropriate applications within the United States, including AWS D1.1, AWS A3.0, ASME Section IX, and API 1104.
- Develop an understanding of correct welding terminology, welding joint geometry, and welding symbols used in industry in accordance with AWS standards.

- Develop an understanding of common non-destructive evaluation (NDE) processes used by welding inspectors in industry, including Penetrant Testing (PT), Magnetic Particle Testing (MT), Radiographic Testing (RT), Ultrasonic Testing (UT), and Eddy Current Testing (ET).
- Develop an understanding of common destructive testing methods used by welding inspectors in industry, including bend testing, hardness testing, fillet-weld break testing, tensile testing, nick-break testing, and macro-etch testing.
- Identify common weld and base metal discontinuities, and develop an understanding of effective evaluation, prevention, and repair methods.
- Develop an understanding of common inspection tools and gages used by a welding inspector.
- Develop an understanding of the common welding qualification documents used by an inspector, including Welding Procedure Specifications (WPS), Procedure Qualification Records (PQR), Welder Performance Qualification Records (WPQR), Mill Test Reports (MTR), and Standard Welding Procedure Specifications (SWPS).
- Perform one or more weld inspections utilizing visual inspection tools and determine acceptability in accordance with provided visual inspection acceptance criteria.
- Perform Penetrant Testing (PT).
- Perform Magnetic Particle Testing (MT).

Welding Metallurgy **3 Credits/90 Clock-Hours**

This course introduces students to the study of ferrous metals, and how welding processes affect metal properties and microstructure. Topics of discussion will include steel manufacturing, grain structures, heat-treating processes, mechanical properties of metals, iron-carbon phase diagrams, and destructive testing.

Objectives:

- Develop an understanding of basic ferrous and nonferrous metallurgy.
- Develop an understanding of basic chemistry concepts as they pertain to metallurgy including atoms, molecules, compounds, elements, grains, crystals, solutions, and alloys.
- Identify the most commonly used hardness-testing methods for metallurgy, including: Brinell, Rockwell, Vickers, Knoop, and superficial.
- Perform Rockwell hardness testing on a variety of material microstructures.
- Develop an understanding of commonly used steel manufacturing processes.
- Develop an understanding of basic material properties concepts as they pertain to metallurgy including ductility, strength, hardness, malleability, toughness, and percent elongation.
- Identify how common alloying elements affect a material's microstructure and mechanical properties.
- Identify basic crystalline grain structures that exist in carbon steel including body-centered cubic (BCC), face-centered cubic (FCC), hexagonal close-packed (HCP), and body-centered tetragonal (BCT).
- Demonstrate the ability to interpret the iron-carbon phase diagram as well as the common phases and properties of phases that exist in carbon steel including ferrite, austenite, pearlite, cementite, martensite and their common combinations.
- Develop an understanding of metallurgical sample preparation for various destructive and non-destructive testing methods.
- Demonstrate an understanding of common heat-treatment processes including quenching, tempering, annealing, and normalizing.
- Identify common surface-hardening techniques including carburizing, nitriding, cold-working, and localized heating.
- Prepare a metallurgical sample for visual analysis utilizing a metallurgical sample polisher.

- Observe various material microstructures utilizing a microscope.