| Auburn School District | | |
|---|---|---|
| **Course: Welding Technology**<br>**Auburn -** Welding | | **Total Framework Hours up to: 720** |
| **CIP Code: 480508** | ☐**Exploratory** ☒**Preparatory** | **Date Last Modified:** 2-1-16 |
| **Career Cluster:** Manufacturing | | **Cluster Pathway:** Production |

| **COMPONENTS AND ASSESSMENTS** |
|---|
| **Performance Assessments:**<br>• Students will successfully complete safety tests for all equipment and demonstrate the ability to comply with all shop, state, and federal safety regulations. |
| **Leadership Alignment:**<br>• Students will complete a shop safety inspection<br>• Students will rotate clean up manager duties<br><br>**Think Creatively**<br>1.A.1 Use a wide range of idea creation techniques (such as brainstorming)<br>1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)<br>**Work Creatively with Others**<br>1.B.1 Develop, implement and communicate new ideas to others effectively<br>1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes<br>**Make Judgments and Decisions**<br>2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs<br>**Reason Effectively**<br>2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation<br>**Solve Problems**<br>2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways |
| ***Standards and Competencies*** |
| **Unit 1:** Basic Safety |

| **Competencies** | **Total Learning Hours for Unit: 140** |
|---|---|
| • Apply the ability to interpret information and instructions presented in both written and verbal form.<br>• Explain the role that safety plays in the construction crafts.<br>• Describe the meaning of job-site safety.<br>• Describe the characteristics of a competent person and a qualified person. | |

- Explain the appropriate safety precautions to take around common job-site hazards.
- Apply the use and care of appropriate personal protective equipment (PPE).
- Properly don and remove personal protective equipment (safety goggles, hard hat, and personal fall protection).
- Follow the safety procedures required for lifting heavy objects.
- Describe safe behavior on and around ladders and scaffolds.
- Explain the importance of Hazard Communications (HazCom) and materials safety data sheets (MSDSs)
- Describe fire prevention and firefighting techniques.
- Define safe work procedures to use around electrical hazards.
- Apply correct use/operation of tools and equipment
- Avoid hazards caused by improper dress, jewelry, etc.
- Recognize and inform instructor of unsafe working conditions
- Apply the ability to comply with state and federal safety regulations
- Identify power tools commonly used in the construction trades.
- Use hand tools safely.
- Describe the basic procedures for taking care of hand tools.
- Basic machine and power tool safety
- Use power tools safely.
- Explain how to maintain power tools properly.
- Explain some of the causes of accidents.
- Be aware of workplace issues such as sexual harassment, stress, and substance abuse.

| ***Aligned Washington State Standards*** | |
|---|---|
| **Educational Technology** | 1.2.1 Communicate and collaborate to learn with others.<br>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.<br>1.3.2 Locate and organize information from a variety of sources and media.<br>2.1.1 Practice personal safety.<br>2.3.1 Select and use common applications.<br>2.3.2 Select and use online applications.<br>2.4.1 Formulate and synthesize new knowledge. |
| **English Language Arts** | Grade 9-10<br>SL--Comprehension and Collaboration (Standards 1, 2)<br>SL--Presentation of Knowledge and Ideas (Standard 6)<br>L--Conventions of Standard English (Standards 1, 2)<br>L--Vocabulary Acquisition and Use (Standard 6)<br>RST--Craft and Structure (Standard 4)<br>RST--Integration of Knowledge and Ideas (Standards 7, 9) |
| **Health and Fitness** | 1.1 Develop fundamental and complex movement skills, as developmentally appropriate.<br>1.2 Safely participates in a variety of developmentally appropriate physical activities.<br>2.1 Recognize patterns of growth and development.<br>2.3 Acquire skills to live safety and reduce health risks.<br>2.1 Recognize patterns of growth and development.<br>3.3 Use social skills to promote health and safety in a variety of situations.<br>3.4 Understand how emotions influence decision-making.<br>4.1 Analyze health and safety information. |
| **Math** | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3) |

| | |
|---|---|
| **Science** | SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br>SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br>INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.<br>INQD: The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br>INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br>APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br>APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:**

- Students will perform oxyfuel cutting demonstrating the following:
  - Straight lines
  - Piercing and slot cutting
  - Bevels
  - Washing

Students will perform oxyfuel welding demonstrating the following:

  - Butt Joint
  - Lap Joint
  - T-Joint

- Students will perform plasma arc cutting

**Leadership Alignment:**

- Students will demonstrate safe behavior and safety awareness in the shop
- Students will set timely personal goals and work towards achieving them
- Students will work together in small groups learning to use the equipment and processes
- Students will mentor other students on proper equipment use and welding technique.

**Think Creatively**

1.A.1 Use a wide range of idea creation techniques (such as brainstorming)

1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

**Work Creatively with Others**

1.B.1 Develop, implement and communicate new ideas to others effectively

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

**Make Judgments and Decisions**

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

**Reason Effectively**

2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

**Solve Problems**

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

***Standards and Competencies***

**Unit 2:** Oxygen/Acetylene Processes

| **Competencies** | **Total Learning Hours for Unit: 100** |
|---|---|

- Apply critical thinking skills and the ability to solve problems
- Apply effective relationship skills with teammates and supervisors, the ability to work on a team.
- Identify some common hazards related to Oxy/acetylene welding and cutting processes.
- Explain and identify proper personal protection related to Oxy/acetylene welding and cutting processes..
- Apply how to avoid welding fumes related to Oxy/acetylene welding and cutting processes.
- Explain some of the causes of accidents. related to to Oxy/acetylene welding and cutting processes..

- Apply safety techniques for storing and handling cylinders.
- Apply proper material handling methods.
- Recognize and identify basic blueprint terms, components, and symbols.
- Relate information on blueprints to actual locations on the print.
- Interpret and use drawing dimensions.
- Check for joint misalignment and poor fit-up before and after welding.
- Set up oxyfuel equipment.
- Light and adjust an oxyfuel torch.
- Shut down oxyfuel cutting equipment.
- Disassemble oxyfuel equipment.
- Change empty cylinders.
- Perform oxyfuel cutting:
  - Straight lines
  - Piercing and slot cutting
  - Bevels
  - Washing
- Explain joint design considerations.
- Identify and explain codes governing welding.
- Identify and explain imperfections in Oxy/acetylene welding and cutting processes and their causes.
- Explain the importance of quality workmanship.
- Identify common destructive testing methods.
- Identify and understand plasma arc cutting processes.
- Prepare and set up plasma arc cutting equipment for various metals and application's
- Use plasma arc cutting equipment to make various types of cuts.
- Properly store equipment and clean the work area after use.

| ***Aligned Washington State Standards*** | |
|---|---|
| **Art** | 2.1 Apply a creative process in the arts<br>3.1 Use the arts to express and present ideas and feelings<br>3.2 Use the arts to communicate for a specific purpose |
| **Educational Technology** | 1.2.1 Communicate and collaborate to learn with others.<br>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.<br>1.3.2 Locate and organize information from a variety of sources and media.<br>2.1.1 Practice personal safety.<br>2.3.1 Select and use common applications.<br>2.3.2 Select and use online applications.<br>2.4.1 Formulate and synthesize new knowledge. |
| **English Language Arts** | Grade 9-10<br>SL--Comprehension and Collaboration (Standards 1, 2)<br>SL--Presentation of Knowledge and Ideas (Standard 6)<br>L--Conventions of Standard English (Standards 1, 2)<br>L--Vocabulary Acquisition and Use (Standard 6)<br>RST--Craft and Structure (Standard 4)<br>RST--Integration of Knowledge and Ideas (Standards 7, 9) |

| | |
|---|---|
| **Health and Fitness** | 1.1 Develop fundamental and complex movement skills, as developmentally appropriate.<br>1.2 Safely participates in a variety of developmentally appropriate physical activities.<br>2.1 Recognize patterns of growth and development.<br>2.3 Acquire skills to live safety and reduce health risks.<br>3.1 Understand how environmental factors affect one's health. (Air, water, noise, chemicals).<br>3.3 Use social skills to promote health and safety in a variety of situations.<br>3.4 Understand how emotions influence decision-making.<br>4.1 Analyze health and safety information. |
| **Math** | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3)<br>G-SRT-Define trigonometric ratios and solve problems involving right triangles (Standards 6, 7, 8)<br>G-GMD-Visualize relationships between two-dimensional and three-dimensional objects (Standard 4)<br>G-MG-Apply geometric concepts in modeling situations (Standards 1, 2, 3) |
| **Science** | SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br>SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br>INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.<br>INQD: The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br>INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br>APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br>APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |
| **Social Studies** | Economics 2.4 Understand that investment in people, tools, and technology affect employment levels and standard of living |

**COMPONENTS AND ASSESSMENTS**

**Performance Assessments:**

- Given drawings students will demonstrate proper metal preparation and assembly fit up, correctly calculate quantity and cost of materials needed to complete the project, and verify the final product meets all specifications.

**Leadership Alignment:**

- Students will demonstrate safe behavior and safety awareness in the shop
- Students will set timely personal goals and work towards achieving them
- Students will work together in small groups learning to use the equipment and processes
- Students will mentor other students on proper equipment use and welding technique
- Students will work individually and in teams to ensure proper alignment of fabricated items
- Students will learn to ask for help and work in teams on complicated fabrication assemblies.

**Think Creatively**

1.A.1 Use a wide range of idea creation techniques (such as brainstorming)

1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

**Work Creatively with Others**

1.B.1 Develop, implement and communicate new ideas to others effectively

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

**Make Judgments and Decisions**

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

**Reason Effectively**

2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

**Solve Problems**

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

**Produce Results**

10.B.1 Demonstrate additional attributes associated with producing high quality products. (1a – 1h)

***Standards and Competencies***

**Unit 3:** Fabrication Process

| **Competencies** | **Total Learning Hours for Unit: 140** |
|---|---|

- Research post-secondary educational opportunities in the Puget Sound area
- Model negotiation and conflict resolution skills
- Apply an understanding of the importance of confidentiality
- Use proper writing style to accurately communicate thoughts, ideas, information, and messages (i.e. memos, letters, reports)
- State information in a clear, concise, and logical manner
- Read and explain simple and complex instructions from technical documents
- Model appropriate dress and behavior for the job
- Compose an application letter for employment
- Prepare a data sheet and resume
- Complete an employment application form
- Complete an interview demonstrating appropriate appearance and self-confidence

- Explain how to avoid electric shock when welding.
- Using a nibbler, cutter, or grinder, mechanically prepare the edge of a mild steel plate ¼" to ¾" thick and 22 1/2' (or 30' depending on equipment available).
- Using a nibbler, cutter, or grinder, mechanically prepare the edge of a pipe
- Select the proper joint design based on a welding procedure specification (WPS) or instructor direction.
- Identify and describe the use of slings and common rigging hardware.
- Describe basic inspection techniques and rejection criteria used for slings and hardware.
- Identify and explain codes governing welding.
- Identify and explain weld imperfections and their causes.
- Identify and explain nondestructive examination practices.
- Identify and explain welder qualifications tests.
- A-Explain the importance of quality workmanship.
- Identify common destructive testing methods for more advanced applications
- Use fit-up gauges and measuring devices to check joint fit-up.
- Identify and explain distortion and how it is controlled. for more advanced applications

| ***Aligned Washington State Standards*** | |
|---|---|
| **Art** | 2.1 Apply a creative process in the arts<br>3.1 Use the arts to express and present ideas and feelings<br>3.2 Use the arts to communicate for a specific purpose |
| **Educational Technology** | 1.2.1 Communicate and collaborate to learn with others.<br>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.<br>1.3.2 Locate and organize information from a variety of sources and media.<br>2.1.1 Practice personal safety.<br>2.3.1 Select and use common applications.<br>2.3.2 Select and use online applications.<br>2.4.1 Formulate and synthesize new knowledge. |
| **English Language Arts** | Grade 9-10<br>SL--Comprehension and Collaboration (Standards 1, 2)<br>SL--Presentation of Knowledge and Ideas (Standard 6)<br>L--Conventions of Standard English (Standards 1, 2)<br>L--Vocabulary Acquisition and Use (Standard 6)<br>RST--Craft and Structure (Standard 4)<br>RST--Integration of Knowledge and Ideas (Standards 7,9) |
| **Health and Fitness** | 1.1 Develop fundamental and complex movement skills, as developmentally appropriate.<br>1.2 Safely participates in a variety of developmentally appropriate physical activities.<br>2.1 Recognize patterns of growth and development.<br>2.3 Acquire skills to live safety and reduce health risks.<br>3.1 Understand how environmental factors affect one's health. (Air, water, noise, chemicals).<br>3.3 Use social skills to promote health and safety in a variety of situations.<br>3.4 Understand how emotions influence decision-making.<br>4.1 Analyze health and safety information. |
| **Math** | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3)<br>G-SRT-Define trigonometric ratios and solve problems involving right triangles (Standards 6, 7, 8)<br>G-GMD-Visualize relationships between two-dimensional and three-dimensional objects (Standard 4)<br>G-MG-Apply geometric concepts in modeling situations (Standards 1, 2, 3) |
| **Science** | SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive |

| | |
|---|---|
| | feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br>SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br>INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.<br>INQD: The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br>INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br>APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br>APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |
| **Social Studies** | Economics 2.4 Understand that investment in people, tools, and technology affect employment levels and standard of living |

## COMPONENTS AND ASSESSMENTS

**Performance Assessments:**

- Students will perform Mig Welding demonstrating the following:
  - Butt Joint
  - Lap Joint
  - T-Joint

**Leadership Alignment:**

- Students will demonstrate safe behavior and safety awareness in the shop
- Students will set timely personal goals and work towards achieving them
- Students will work together in small groups learning to use the equipment and processes
- Students will mentor other students on proper equipment use and welding technique.

**Think Creatively**

1.A.1 Use a wide range of idea creation techniques (such as brainstorming)

1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

**Work Creatively with Others**

1.B.1 Develop, implement and communicate new ideas to others effectively

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

**Make Judgments and Decisions**

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

**Reason Effectively**

2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

**Solve Problems**

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

**Produce Results**

10.B.1 Demonstrate additional attributes associated with producing high quality products. (1a – 1h)

## *Standards and Competencies*

**Unit 4:** MIG Welding

| **Competencies** | **Total Learning Hours for Unit: 120** |
|---|---|

- Identify and explain codes governing welding.
- Identify and explain Mig weld imperfections and their causes.
- Identify and explain nondestructive examination practices for Mig welding.
- Identify and explain Mig welder qualifications tests.
- Explain the importance of quality workmanship.
- Identify common destructive testing methods for Mig welding
- Identify and explain the various parts of a welding symbol.
- Identify and explain fillet and groove weld symbols.
- Read welding symbols on drawings, specifications, and welding procedure specifications.
- Interpret welding symbols from a print.

- Draw welding symbols based on the observation of actual welds.
- Explain gas metal arc welding (GMAW) and flux cored arc welding (FCAW) safety.
- Explain the characteristics of welding current and power sources.
- Identify and explain the use of GMAW and FCAW equipment:
  - Spray transfer
  - Globular
  - Short circuiting
  - Pulse
- Identify and explain the use of GMAW and FCAW shielding gases and filler metals.
- Set up GMAW and FCAW equipment and identify tools for weld cleaning.
- Perform GMAW multiple-pass fillet welds on plate, using solid or composite wire and shielding gas in multiple positions.
- Perform GMAW multiple-pass open-root V-groove welds on plate, using solid or composite wire and shielding gas, in multiple positions.
- Perform GMAW spray fillet and open-root V-groove welds on plate, using solid or composite wire and shielding gas, in flat and horizontal positions.
- Perform FCAW multiple-pass fillet welds on plate in multiple positions using flux cored wire and, if required, shielding gas.
- Perform FCAW multiple-pass open-root V-groove welds on plate in multiple positions using flux cored wire and, if required, shielding gas.

| ***Aligned Washington State Standards*** | |
|---|---|
| **Art** | 2.1 Apply a creative process in the arts<br>3.1 Use the arts to express and present ideas and feelings<br>3.2 Use the arts to communicate for a specific purpose |
| **Educational Technology** | 1.2.1 Communicate and collaborate to learn with others.<br>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.<br>1.3.2 Locate and organize information from a variety of sources and media.<br>2.1.1 Practice personal safety.<br>2.3.1 Select and use common applications.<br>2.3.2 Select and use online applications.<br>2.4.1 Formulate and synthesize new knowledge. |
| **English Language Arts** | Grade 9-10<br>SL--Comprehension and Collaboration (Standards 1, 2)<br>SL--Presentation of Knowledge and Ideas (Standard 6)<br>L--Conventions of Standard English (Standards 1, 2)<br>L--Vocabulary Acquisition and Use (Standard 6)<br>RST--Craft and Structure (Standard 4)<br>RST--Integration of Knowledge and Ideas (Standards 7, 9) |
| **Health and Fitness** | 1.1 Develop fundamental and complex movement skills, as developmentally appropriate.<br>1.2 Safely participates in a variety of developmentally appropriate physical activities.<br>2.1 Recognize patterns of growth and development.<br>2.3 Acquire skills to live safety and reduce health risks.<br>3.1 Understand how environmental factors affect one's health. (Air, water, noise, chemicals).<br>3.3 Use social skills to promote health and safety in a variety of situations.<br>3.4 Understand how emotions influence decision-making.<br>4.1 Analyze health and safety information. |
| **Math** | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3)<br>G-SRT-Define trigonometric ratios and solve problems involving right triangles (Standards 6, 7, 8)<br>G-GMD-Visualize relationships between two-dimensional and three-dimensional objects (Standard 4), |

| | |
|---|---|
| | G-MG-Apply geometric concepts in modeling situations (Standards 1, 2, 3) |
| **Science** | SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br>SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br>INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.<br>INQD: The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br>INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br>APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br>APPC |
| **Social Studies** | Economics 2.4 Understand that investment in people, tools, and technology affect employment levels and standard of living |

## COMPONENTS AND ASSESSMENTS

**Performance Assessments:**

- Students will demonstrate correct open-root V-groove welds in the:
  - Flat (1G) position
  - Horizontal (2G) position
  - Vertical (3G) position
  - Overhead (4G) position

- Students will prepare shielded metal arc welding (SMAW) equipment for open-root V-groove pipe welds and explain open-root V-groove pipe welds.
- Students will demonstrate correct SMAW for open-root V-groove pipe welds in the:
  - Flat (1G-ROTATED) position
  - Horizontal (2G) position
  - Multiple (5G) position
  - Multiple inclined (6G) position

**Leadership Alignment:**

- Students will demonstrate safe behavior and safety awareness in the shop
- Students will set timely personal goals and work towards achieving them
- Students will work together in small groups learning to use the equipment and processes
- Students will mentor other students on proper equipment use and welding technique.

**Think Creatively**

1.A.1 Use a wide range of idea creation techniques (such as brainstorming)

1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

**Work Creatively with Others**

1.B.1 Develop, implement and communicate new ideas to others effectively

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

**Make Judgments and Decisions**

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

**Reason Effectively**

2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

**Solve Problems**

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

**Produce Results**

10.B.1 Demonstrate additional attributes associated with producing high quality products. (1a – 1h)

## *Standards and Competencies*

**Unit 5:** SMAW Welding

| **Competencies** | **Total Learning Hours for Unit: 120** |
|---|---|

- Identify and explain codes governing SMAW welding.
- Identify and explain SMAW weld imperfections and their causes.

- Identify and explain nondestructive examination practices for SMAW.
- Identify and explain SMAW welder qualifications tests.
- Explain the importance of quality workmanship for SMAW.
- Identify common destructive testing methods for SMAW..
- Explain setting up arc welding equipment.
- Identify factors that affect electrode selection.
- Explain the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME) filler metal classification system.
- Identify different types of filler metals.
- Explain the storage and control of filler metals.
- Identify and select the proper electrode for an identified welding task.
- Set up shielded metal arc welding (SMAW) equipment.
- Describe causes of arc blow and wander.
- Make stringer, weave, and overlapping beads.
- Make fillet welds in the:
  - Horizontal (2F) position
  - Vertical (3F) position
  - Overhead (4F) position
- Identify and explain groove welds.
- Identify and explain groove welds with backing.
- Set up shielded metal arc welding (SMAW) equipment for making V-groove welds.
- Perform SMAW for F-groove welds with backing in the:
  - Flat (1G) position
  - Horizontal (2G) position
  - Vertical (3G) position
  - Overhead (4G) position
- Identify and explain distortion and how it is controlled.
- Fit-up joint using plate and pipe fit-up tools.
- Check for joint misalignment and poor fit-up before and after welding.
- Prepare shielded metal arc welding (SMAW) equipment for open-root V-groove welds.
- Perform open-root V-groove welds in the:
  - Flat (1G) position
  - Horizontal (2G) position
  - Vertical (3G) position
- Overhead (4G) position
- Prepare shielded metal arc welding (SMAW) equipment for open-root V-groove pipe welds.
- Identify and explain open-root V-groove pipe welds.
- Perform SMAW for open-root V-groove pipe welds in the:
  - Flat (1G-ROTATED) position
  - Horizontal (2G) position
  - Multiple (5G) position
  - Multiple inclined (6G) position
- Identify and explain a welding detail drawing.
- Identify and explain lines, material fills, and sections.
- Identify and explain object views.

- Identify and explain notes and bill of materials.
- Develop basic welding drawings.
- Apply productive work habits and traits including attendance, punctuality, positive self-image, dependability, enthusiasm, cooperation, honesty, initiative, and safe consciousness
- Apply leadership skills including following written and oral directions, maintaining an organized work area, making independent decisions, working with others, managing time, handling criticism, and handling stress
- Plan, coordinate, and implement plans requiring teamwork
- Critique work of others and offer suggestions for improvement
- Lead group activities
- Delegate tasks and responsibilities

| ***Aligned Washington State Standards*** | |
|---|---|
| **Art** | 2.1 Apply a creative process in the arts<br>3.1 Use the arts to express and present ideas and feelings<br>3.2 Use the arts to communicate for a specific purpose |
| **Educational Technology** | 1.2.1 Communicate and collaborate to learn with others.<br>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.<br>1.3.2 Locate and organize information from a variety of sources and media.<br>2.1.1 Practice personal safety.<br>2.3.1 Select and use common applications.<br>2.3.2 Select and use online applications.<br>2.4.1 Formulate and synthesize new knowledge. |
| **English Language Arts** | Grade 9-10<br>SL--Comprehension and Collaboration (Standards 1, 2)<br>SL--Presentation of Knowledge and Ideas (Standard 6)<br>L--Conventions of Standard English (Standards 1, 2)<br>L--Vocabulary Acquisition and Use (Standard 6)<br>RST--Craft and Structure (Standard 4)<br>RST--Integration of Knowledge and Ideas (Standards 7, 9) |
| **Health and Fitness** | 1.1 Develop fundamental and complex movement skills, as developmentally appropriate.<br>1.2 Safely participates in a variety of developmentally appropriate physical activities.<br>2.1 Recognize patterns of growth and development.<br>2.3 Acquire skills to live safety and reduce health risks.<br>3.1 Understand how environmental factors affect one's health. (Air, water, noise, chemicals).<br>3.3 Use social skills to promote health and safety in a variety of situations.<br>3.4 Understand how emotions influence decision-making.<br>4.1 Analyze health and safety information. |
| **Math** | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3)<br>G-SRT-Define trigonometric ratios and solve problems involving right triangles (Standards 6, 7, 8)<br>G-GMD-Visualize relationships between two-dimensional and three-dimensional objects (Standard 4)<br>G-MG-Apply geometric concepts in modeling situations (Standards 1, 2, 3) |
| **Science** | SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br>SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br>INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge. |

| | |
|---|---|
| | INQD: The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br>INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br>APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br>APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |
| **Social Studies** | Economics 2.4 Understand that investment in people, tools, and technology affect employment levels and standard of living |

## COMPONENTS AND ASSESSMENTS

**Performance Assessments:**

- Students will:
  - Demonstrate a correct open-root V-groove weld on carbon steel plate in the 1G (flat) position using GTAW and carbon steel filler metal.
  - Demonstrate a correct multiple-pass open-root V-groove weld on carbon steel plate in the 2G (horizontal) position using GTAW and carbon steel filler metal.
  - Demonstrate a correct multiple-pass open-root V-groove weld on carbon steel plate in the 3G (vertical) position using GTAW and carbon steel filler metal.
  - Demonstrate a correct multiple-pass open-root V-groove weld on carbon steel plate in the 4G (overhead) position using GTAW and carbon steel filler metal.
  - Identify and explain aluminum metallurgy.
  - Explain and identify characteristics of aluminum.
  - Explain GTAW and set up equipment to weld aluminum plate.
  - Explain and practice GTAW techniques for plate, including padding n the flat position with stringer beads, using aluminum filler metal.
  - Demonstrate a correct fillet welds on aluminum plate in the following positions:
    - Flat (1F) position
    - Horizontal (2G) position
    - Vertical (3G) position
    - Overhead (4G) position

**Leadership Alignment:**

- Students will demonstrate safe behavior and safety awareness in the shop
- Students will set timely personal goals and work towards achieving them
- Students will work together in small groups learning to use the equipment and processes
- Students will mentor other students on proper equipment use and welding technique.

**Think Creatively**

1.A.1 Use a wide range of idea creation techniques (such as brainstorming)

1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

**Work Creatively with Others**

1.B.1 Develop, implement and communicate new ideas to others effectively

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

**Make Judgments and Decisions**

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

**Reason Effectively**

2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

**Solve Problems**

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

**Produce Results**

10.B.1 Demonstrate additional attributes associated with producing high quality products. (1a – 1h)

## *Standards and Competencies*

**Unit 6:** TIG Welding

| Competencies | Total Learning Hours for Unit: 100 |
|---|---|

- Identify and explain codes governing Tig welding.
- Identify and explain weld imperfections and their causes.in Tig welding.
- Identify and explain nondestructive examination practices Tig welding..
- Identify and explain welder qualifications tests for Tig welding..
- Explain the importance of quality workmanship for Tig welding.
- Identify common destructive testing methods for Tig welding.
- Explain gas tungsten arc welding (GTAW) safety.
- Identify and explain the use of GTAW equipment.
- Identify and explain the use of GTRAW filler metals.
- Identify and explain the use of GTAW shielding gases.
- Set up GTAW equipment.
- Build a pad in the flat position with stringer beads using GTAW and carbon steel filler metal.
- Make multiple-pass open-root V-groove welds on carbon steel plate in the 1G (flat) position using GTAW and carbon steel filler metal.
- Make multiple-pass open-root V-groove welds on carbon steel plate in the 2G (horizontal) position using GTAW and carbon steel filler metal.
- Make multiple-pass open-root V-groove welds on carbon steel plate in the 3G (vertical) position using GTAW and carbon steel filler metal.
- Make multiple-pass open-root V-groove welds on carbon steel plate in the 4G (overhead) position using GTAW and carbon steel filler metal.
- Identify and explain aluminum metallurgy.
- Explain and identify characteristics of aluminum.
- Explain GTAW and set up equipment to weld aluminum plate.
- Explain and practice GTAW techniques for plate, including padding n the flat position with stringer beads, using aluminum filler metal.
- Make fillet welds on aluminum plate in the following positions:
  - Flat (1F) position
  - Horizontal (2G) position
  - Vertical (3G) position
  - Overhead (4G) position
- Perform shielded metal arc welding (GTAW) on stainless steel open-root V-groove joints in the following positions:
  - Flat (1G) position
  - Horizontal (2G) position
  - Vertical (3G) position
  - Overhead (4g) position

| ***Aligned Washington State Standards*** | |
|---|---|
| **Art** | 2.1 Apply a creative process in the arts<br>3.1 Use the arts to express and present ideas and feelings<br>3.2 Use the arts to communicate for a specific purpose |
| **Educational Technology** | 1.2.1 Communicate and collaborate to learn with others.<br>1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.<br>1.3.2 Locate and organize information from a variety of sources and media.<br>2.1.1 Practice personal safety.<br>2.3.1 Select and use common applications.<br>2.3.2 Select and use online applications.<br>2.4.1 Formulate and synthesize new knowledge. |
| **English Language Arts** | Grade 9-10 |

| | |
|---|---|
| | SL--Comprehension and Collaboration (Standards 1, 2)<br>SL--Presentation of Knowledge and Ideas (Standard 6)<br>L--Conventions of Standard English (Standards 1, 2)<br>L--Vocabulary Acquisition and Use (Standard 6)<br>RST--Craft and Structure (Standard4)<br>RST--Integration of Knowledge and Ideas (Standards 7, 9) |
| **Health and Fitness** | 1.1 Develop fundamental and complex movement skills, as developmentally appropriate.<br>1.2 Safely participates in a variety of developmentally appropriate physical activities.<br>2.1 Recognize patterns of growth and development.<br>2.3 Acquire skills to live safety and reduce health risks.<br>3.1 Understand how environmental factors affect one's health. (Air, water, noise, chemicals).<br>3.3 Use social skills to promote health and safety in a variety of situations.<br>3.4 Understand how emotions influence decision-making.<br>4.1 Analyze health and safety information. |
| **Math** | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3) G-SRTC,<br>G-GMD-Visualize relationships between two-dimensional and three-dimensional objects (Standard 4)<br>G-MG-Apply geometric concepts in modeling situations (Standards 1, 2, 3) |
| **Science** | SYSA: Feedback is a process in which the output of a system provides information used to regulate the operation of the system. Positive feedback increases the disturbance to a system. Negative feedback reduces the disturbance to a system.<br>SYSB: Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.<br>INQC: Conclusions must be logical, based on evidence, and consistent with prior established knowledge.<br>INQD: The methods and procedures that scientists use to obtain evidence must be clearly reported to enhance opportunities for further investigation.<br>INQF: Science is a human endeavor that involves logical reasoning and creativity and entails the testing, revision, and occasional discarding of theories as new evidence comes to light.<br>APPB: The technological design process begins by defining a problem in terms of criteria and constraints, conducting research, and generating several different solutions.<br>APPC: Choosing the best solution involves comparing alternatives with respect to criteria and constraints, then building and testing a model or other representation of the final design. |
| **Social Studies** | Economics 2.4 Understand that investment in people, tools, and technology affect employment levels and standard of living |

| *21st Century Skills* | | |
|---|---|---|
| Check those that students will demonstrate in this course: | | |
| **LEARNING & INNOVATION**<br><br>**Creativity and Innovation**<br>☒Think Creatively<br>☒Work Creatively with Others<br>☒Implement Innovations<br><br>**Critical Thinking and Problem Solving**<br>☒Reason Effectively<br>☒**U**se Systems Thinking<br>☒Make Judgments and Decisions<br>☒Solve Problems<br><br>**Communication and Collaboration**<br>☒Communicate Clearly<br>☒Collaborate with Others | **INFORMATION, MEDIA & TECHNOLOGY SKILLS**<br><br>**Information Literacy**<br>☒Access and /evaluate Information<br>☒Use and Manage Information<br><br>**Media Literacy**<br>☒Analyze Media<br>☒Create Media Products<br><br>**Information, Communications and Technology (ICT Literacy)**<br>☒Apply Technology Effectively | **LIFE & CAREER SKILLS**<br><br>**Flexibility and Adaptability**<br>☒Adapt to Change<br>☒Be Flexible<br><br>**Initiative and Self-Direction**<br>☒Manage Goals and Time<br>☒Work Independently<br>☒Be Self-Directed Learners<br><br>**Social and Cross-Cultural**<br>☒Interact Effectively with Others<br>☒Work Effectively in Diverse Teams<br><br>**Productivity and Accountability**<br>☒Manage Projects<br>☒Produce Results<br><br>**Leadership and Responsibility**<br>☒Guide and Lead Others<br>☒Be Responsible to Others |