

**Florida Department of Education
Curriculum Framework**

Program Title: Welding Technology
Program Type: Career Preparatory
Career Cluster: Manufacturing

Career Certificate Program		
Program Number	J400400	
CIP Number	0648050805	
Grade Level	30, 31	
Standard Length	1050 hours	
Teacher Certification	Refer to the Program Structure section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	Assignment pending.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communications (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the manufacturing career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in the welding industry.

The content includes but is not limited to planning, management, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of three occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	PMT0070	Welder Assistant 1	METAL WORK 7G WELDING @7 7G	150 hours	
	PMT0071	Welder Assistant 2		150 hours	
B	PMT0072	Welder, SMAW 1		150 hours	
	PMT0073	Welder, SMAW 2		150 hours	
C	PMT0074	Welder		450 hours	

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Welding Technology program can be found using the following link: <https://www.aws.org/certification/page/home>

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.
2. Apply appropriate academic and technical skills.
3. Attend to personal health and financial well-being.
4. Communicate clearly, effectively and with reason.
5. Consider the environmental, social and economic impacts of decisions.
6. Demonstrate creativity and innovation.
7. Employ valid and reliable research strategies.
8. Utilize critical thinking to make sense of problems and persevere in solving them.
9. Model integrity, ethical leadership and effective management.
10. Plan education and career path aligned to personal goals.
11. Use technology to enhance productivity.
12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

- 01.0 Demonstrate an understanding and apply workplace safety and workplace organization skills.
- 02.0 Demonstrate basic knowledge of industrial and manufacturing processes.
- 03.0 Describe and identify metals and their properties accurately.
- 04.0 Demonstrate and apply basic knowledge of drawing and interpreting AWS welding symbols.
- 05.0 Apply basic oxy-fuel gas cutting principles and practices.
- 06.0 Create a product using basic oxy-fuel gas cutting principles and practices.
- 07.0 Apply intermediate oxy-fuel gas cutting principles and practices.
- 08.0 Demonstrate plasma arc cutting principles and practices.
- 09.0 Demonstrate a basic understanding of shielded metal arc welding (SMAW).
- 10.0 Create a product using basic shielded metal arc welding (SMAW) principles and practices.
- 11.0 Apply basic shielded metal arc welding (SMAW) skills.
- 12.0 Demonstrate and apply Carbon Arc Gouging (GAC) principles and practices.
- 13.0 Apply visual examination skills.
- 14.0 Create a product using Carbon Arc Gouging and basic shielded metal arc welding (SMAW) principles and practices.
- 15.0 Demonstrate an understanding of employability skills and career opportunities related to the welding industry.
- 16.0 Apply intermediate shielded metal arc welding (SMAW) skills.
- 17.0 Create a product using intermediate shielded metal arc welding (SMAW) principles and practices
- 18.0 Apply basic gas metal arc welding (GMAW) skills.
- 19.0 Apply intermediate gas metal arc welding (GMAW) skills.
- 20.0 Apply basic flux-core arc welding (FCAW) skills.
- 21.0 Apply intermediate flux-core arc welding (FCAW) skills.
- 22.0 Apply basic gas tungsten arc welding (GTAW) skills.
- 23.0 Apply intermediate gas tungsten arc welding (GTAW) skills.
- 24.0 Demonstrate and apply basic pipe welding principles and practices.

**Florida Department of Education
Student Performance Standards**

Program Title: Welding Technology
Career Certificate Program Number: J400400

Course Description: The Welder Assistant 1 course prepares students for entry into the welding industry. Students explore career opportunities and requirements of a professional welder. Content emphasizes beginning skills key to the success of working in the welding industry. Students study workplace safety and organization, basic manufacturing processes, metals identification, basic interpretation of welding symbols, and oxyfuel gas cutting practices.

Course Number: PMT0070
Occupational Completion Point: A (1 of 2)
Welder Assistant 1 – 150 Hours

01.0 Demonstrate an understanding and apply workplace safety and workplace organization.--The student will be able to:

01.01 Locate and use Safety Data Sheets (SDS).

01.02 Demonstrate knowledge of first aid or first response procedures.

01.03 Identify safety procedures in case of smoke or chemical inhalation.

01.04 Demonstrate knowledge of material handling techniques to safely move materials.

01.05 Demonstrate the proper techniques for lifting.

01.06 Proactively respond to a safety concern and notify the instructor.

01.07 Demonstrate knowledge of emergency exits and signage.

01.08 Demonstrate knowledge of various emergency alarms and procedures

01.09 Perform emergency drills and participate in emergency teams.

01.10 Demonstrate knowledge of clean-up procedures.

01.11 Explain Lock Out/Tag Out requirements procedures, including confined space awareness.

01.12 Demonstrate knowledge of machinery and equipment safety functions to determine if all safeguards are operational.

01.13 Identify procedures for handling hazardous material.

01.14 Develop safety checklists.

01.15 Determine the appropriate corrective action after an unsafe condition is identified.

01.16 Demonstrate knowledge of safety requirements for manual, electrical-powered, and pneumatic tools.

01.17 Demonstrate knowledge of safety requirements for operation of automated machines.

01.18	Perform safety and environmental inspections.
01.19	Demonstrate skill in performing leak checks to determine if toxic or hazardous material is escaping from a piece of equipment.
01.20	Demonstrate knowledge of proper and safe installation techniques as described in manuals, checklists and regulations.
01.21	Demonstrate knowledge of equipment shutdown procedures.
01.22	Identify-safety related maintenance procedures.
01.23	Selecting and use of personal protective equipment (PPE) correctly.
01.24	Demonstrate knowledge of ergonomic impact of work techniques.
01.25	Demonstrate knowledge of, and follow applicable safety laws, regulations and the environment (e.g., Occupational Safety and Health Administration (OSHA)).
01.26	Apply Occupational Safety Health Administration (OSHA) safety standards properly.
01.27	Research and identify class A, B, and C type fires.
01.28	Demonstrate and apply the proper procedures for extinguishing class A, B and C type fires.
01.29	Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.
01.30	Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200)
02.0	Demonstrate basic knowledge of industrial and manufacturing processes.--The student will be able to:
02.01	Demonstrate knowledge of the use of current manufacturing processes as related to the welding industry.
02.02	Demonstrate an understanding of the importance and impact of routine maintenance of machines and equipment.
02.03	Understand the processes of separating, forming, conditioning, fabricating and finishing of materials.
02.04	Explain the difference between primary and secondary manufacturing processes.
03.0	Describe and identify metals and their properties accurately.--The student will be able to:
03.01	Describe and understand the steel making process.
03.02	Describe and understand the differences between ferrous and nonferrous metals.
03.03	Describe and understand casting, alloys and forging.
03.04	Identify and understand metallurgical processes related to metals such as galvanized iron and steel, aluminum stainless steel, sheet metal, copper and brass.
03.05	Identify, understand, and describe thermal properties of metals.
03.06	Identify and describe common gages, shapes and dimensions of metals.
04.0	Demonstrate and apply basic knowledge of drawing and interpreting AWS welding symbols.--The student will be able to:

04.01	Interpret, understand, and apply elements of a drawing or sketch.
04.02	Interpret, understand, and apply welding symbol information.
04.03	Design and create a drawing using welding symbology.
04.04	Identify a specified weld using a welding symbol.
04.05	Draw welding symbols using given variables.
04.06	Use and apply appropriate mathematical practices to the design and creation of drawings using welding symbols.
05.0	Apply basic oxy-fuel gas cutting principles and practices.--The student will be able to:
05.01	Perform external inspections of equipment and accessories.
05.02	Make minor repairs to equipment and accessories.
05.03	Set up manual OFC operations for plain carbon steel.
05.04	Operate manual oxy-fuel cutting equipment.
05.05	Perform straight cutting operations using manual oxy-fuel cutting process on plain carbon steel.
06.0	Create a product using basic oxy-fuel gas cutting principles and practices.--The student will be able to:
06.01	Design and create a basic work of art or project utilizing material and skills developed.
06.02	Produce a product using drawings with tolerances and specifications.
06.03	Create and deliver a presentation to communicate project results.

Course Description: The Welder Assistant 2 course is designed to build on the skills and knowledge students learned in Welder Assistant 1 for entry into the welding industry. Students explore career opportunities and requirements of a professional welder. Content emphasizes beginning skills key to the success of working in the welding industry. Students study drawings and welding symbols, intermediate oxyfuel gas cutting practices, plasma arc cutting principles and basic shielded metal arc welding (SMAW).

Course Number: PMT0071

Occupational Completion Point: A (2 of 2)

Welder Assistant 2 – 150 Hours

07.0	Apply intermediate oxy-fuel gas cutting principles and practices.--The student will be able to:
07.01	Apply intermediate manual oxy-fuel gas cutting skills.
07.02	Perform shape cutting operations on plain carbon steel.
07.03	Perform bevel cutting operations on plain carbon steel.

07.04	Remove weld metal on plain carbon steel using weld washing techniques.
07.05	Apply machine oxy-fuel gas cutting (track burner) skills.
07.06	Perform safety inspections of equipment and accessories.
07.07	Make minor external repairs to equipment and accessories.
07.08	Set up for plain carbon steel machine OFC (track burner) operations.
07.09	Operate machine oxy-fuel gas cutting (track burner) equipment.
07.10	Perform straight cutting operations on plain carbon steel.
08.0	Demonstrate plasma arc cutting principles and practices.--The student will be able to:
08.01	Perform safety inspections of equipment and accessories.
08.02	Make minor external repairs to equipment and accessories.
08.03	Perform metal removal operations.
08.04	Make minor repairs to equipment and accessories.
08.05	Set up for using plasma arc cutting operations.
08.06	Operate manual plasma arc cutting equipment.
08.07	Perform shape cutting operations using plasma arc cutting process.
09.0	Demonstrate a basic understanding of shielded metal arc welding (SMAW).--The student will be able to:
09.01	Perform external inspections of SMAW equipment and accessories.
09.02	Make minor repairs to SMAW equipment and accessories.
09.03	Set up shielded metal arc welding operations on plain carbon steel.
09.04	Operate shielded metal arc welding equipment.
09.05	Make pad welds, all positions, on plain carbon steel.
10.0	Create a product using oxy-fuel gas cutting and introductory shielded metal arc welding (SMAW) principles and practices.--The student will be able to:
10.01	Design and create a work of art or project utilizing material and skills learned.
10.02	Create a working drawing or blue print using welding symbols.
10.03	Design a product from a working drawing or blue print created.
10.04	Fabricate a product using the skills learned related to oxy-fuel gas cutting and introductory shielded metal arc welding (SMAW).
10.05	Create and deliver a presentation to communicate project results.

Course Description: The Welder SMAW 1 course prepares students for entry into the welding industry as a basic Shielded Metal Arc Welder. Students explore career opportunities and requirements of a professional welder. Content emphasizes beginning skills key to the success of working in the welding industry. Students study basic shielded metal arc welding (SMAW), Carbon Arc Gouging (GAC) principles, and visual examination skills.

Course Number: PMT0072 Occupational Completion Point: B (1 of 2) Welder, SMAW 1 – 150 Hours	
11.0	Demonstrate and apply basic shielded metal arc welding (SMAW) skills.--The student will be able to:
11.01	Perform external inspections of SMAW equipment and accessories.
11.02	Make minor repairs to SMAW equipment and accessories.
11.03	Set up shielded metal arc welding operations on plain carbon steel.
11.04	Operate shielded metal arc welding equipment.
11.05	Make pad welds, all positions, on plain carbon steel.
11.06	Make fillet welds, all positions, on plain carbon steel.
11.07	Make groove welds, all positions, on plain carbon steel.
12.0	Demonstrate and apply Carbon Arc Gouging (GAC) principles and practices.--The student will be able to:
12.01	Perform safety inspections of equipment and accessories.
12.02	Repair unacceptable weld profiles.
12.03	Properly set up equipment, accessories, and machine for Carbon Arc Gouging (GAC)
12.04	Apply Manual Air (Carbon Arc Gouging) and Cutting (CAC-A) skills.
12.05	Set up manual air carbon arc gouging and cutting operations.
12.06	Operate manual air carbon arc cutting equipment.
12.07	Apply manual Arc Gouging and Arc Cutting (AC) skills.
13.0	Apply visual examination skills.--The student will be able to:
13.01	Examine cut surfaces and edges of prepared base metal parts.
13.02	Examine tack, intermediate pass and cover pass.
14.0	Create a product using Carbon Arc Gouging and basic shielded metal arc welding (SMAW) principles and practices.--The student will be able to:

14.01	Design and create a work of art or project utilizing material and skills learned.
14.02	Create a working drawing or blue print using welding symbols.
14.03	Design a product from a working drawing or blue print created.
14.04	Fabricate a product using the skills learned related to Carbon Arc Gouging and basic shielded metal arc welding (SMAW).
14.05	Create and deliver a presentation to communicate project results.

Course Description: The Welder SMAW 2 course is designed to build on the skills and knowledge students learned in Welder SMAW 1 for entry into the welding industry as a basic Shielded Metal Arc Welder. Students explore career opportunities and requirements of a professional welder. Content emphasizes beginning skills key to the success of working in the welding industry. Students study employability and welding careers and intermediate shielded metal arc welding (SMAW).

Course Number: PMT0073

Occupational Completion Point: B (2 of 2)

Welder, SMAW 2 – 150 Hours

15.0	Demonstrate an understanding of employability skills and career opportunities related to the welding industry.--The student will be able to:
15.01	Demonstrate knowledge of good workplace behavior and how to address improper workplace behavior.
15.02	Discuss motivation and human behavior.
15.03	Develop a personal stress management plan.
15.04	Demonstrate knowledge of ways to improve reading, listening and writing skills.
15.05	Demonstrate knowledge of techniques for making effective presentations.
15.06	Use different forms of technology communication.
15.07	Provide effective feedback and make suggestions.
15.08	Demonstrate appropriate customer service skills and techniques.
15.09	Demonstrate knowledge of roles and responsibilities of team members.
15.10	Align team goals (that are specific, documented, measurable and achievable) to customer and business production needs.
15.11	Effectively communicate production and process information.
15.12	Develop personal career plan that includes goals, objectives and strategies.
15.13	Examine licensing, certification and industry credentialing requirements.
15.14	Evaluate and compare employment opportunities that match career goals.

15.15	Identify and exhibit traits for retaining employment.
15.16	Identify opportunities and research requirements for career advancement.
15.17	Research the benefits of ongoing professional development.
15.18	Examine and describe entrepreneurship opportunities as a career planning option.
16.0	Apply intermediate shielded metal arc welding (SMAW) skills.--The student will be able to:
16.01	Make single "V" groove welds, all positions (visual inspection criteria, using current and applicable welding industry codes) on plain carbon steel with backing.
16.02	Perform 1G - 4G limited thickness qualification (bend) tests on plain carbon steel plate (using current and applicable welding industry codes).
16.03	Perform destructive root and face bend specimens (using current and applicable welding industry codes).
16.04	Determine and understand WPS and PQR.
17.0	Create a product using intermediate shielded metal arc welding (SMAW) principles and practices.--The student will be able to:
17.01	Design and create a work of art or project utilizing material and skills learned.
17.02	Create a working drawing or blue print using welding symbols learned.
17.03	Design a product from a working drawing or blue print created.
17.04	Fabricate a product using the skills learned related to intermediate shielded metal arc welding (SMAW).
17.05	Repair products of ferrous and non-ferrous metals.
17.06	Create and deliver a presentation to communicate project results.

Course Description: The Welder course builds on the skills and knowledge students learned in the Welder Assistant and Welder SMAW courses. Students explore career opportunities and requirements of a professional welder. Content emphasizes skills key to the success of working in the welding industry. Students study basic and intermediate Gas Metal Arc Welding (GMAW), basic and intermediate Flux-Core Arc Welding (FCAW), basic and intermediate Gas Tungsten Arc Welding (GTAW), and a basic understanding of pipe welding.

Course Number: PMT0074
Occupational Completion Point: C
Welder – 450 Hours

18.0	Apply basic gas metal arc welding (GMAW) skills.--The student will be able to:
18.01	Perform external inspections of GMAW equipment and accessories.
18.02	Make minor repairs to GMAW equipment and accessories.

18.03	Set up gas metal arc welding operations for plain carbon steel.
18.04	Operate gas metal arc welding equipment.
18.05	Make short-circuiting transfer fillet welds, all positions, on plain carbon steel.
18.06	Make Pad welds, all positions, on plain carbon steel.
19.0	Apply intermediate gas metal arc welding (GMAW) skills.--The student will be able to:
19.01	Make Fillet Spray transfer welds, in flat and horizontal positions, on plain carbon steel.
19.02	Make 1G Groove Spray transfer welds on plain carbon steel.
19.03	Set up (GMAW) gas metal arc welding equipment for aluminum, stainless steel.
19.04	Make groove welds 1G Groove position on aluminum.
19.05	Make fillet welds 1F position on stainless.
19.06	Make groove welds 1G position on stainless.
20.0	Apply basic flux-cored arc welding (FCAW) skills.--The student will be able to:
20.01	Perform safety inspections of equipment and accessories.
20.02	Make minor repairs to equipment and accessories.
20.03	Set up for plain carbon steel FCAW operations.
20.04	Operate flux cored arc welding equipment, gas shielded process.
20.05	Make Pad welds, all positions, on plain carbon steel.
21.0	Apply Intermediate flux-core arc welding (FCAW) skills.--The student will be able to:
21.01	Make fillet welds and groove welds in all positions on plain carbon steel.
21.02	Operate flux core arc welding equipment, gas-shielded process, to make fillet welds, all positions, on plain carbon steel.
21.03	Operate flux core arc welding equipment to make groove welds all positions, on plain carbon steel.
22.0	Apply basic gas tungsten arc welding (GTAW) skills.--The student will be able to:
22.01	Perform external inspections of GTAW equipment and accessories.
22.02	Make minor repairs to GTAW equipment and accessories.
22.03	Set up for plain carbon steel, aluminum and stainless steel GTAW operations.
22.04	Operate gas tungsten arc welding equipment.
22.05	Make fillet welds, all position, on plain carbon steel.

23.0	Apply intermediate gas tungsten arc welding (GTAW) skills.--The student will be able to:
23.01	Make 1G - 2G Groove welds on plain carbon steel.
23.02	Make 1F - 3F Fillet welds on aluminum.
23.03	Make 1G Groove welds on aluminum.
23.04	Make 1F - 3F Fillet welds on stainless steel.
23.05	Make 1G - 2G Groove welds on stainless steel.
24.0	Demonstrate and understanding of pipe welding principles and practices.--The student will be able to:
24.01	Research and understand employability opportunities associated with advanced welding skills such as careers in pipe welding.
24.02	Set up welding equipment for shielded metal arc welding (SMAW) processes for pipe welding on carbon steel pipe.
24.03	Tack and weld carbon steel in the 1G position.

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercultural career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Additional Resources

For additional information regarding articulation agreements, Bright Futures Scholarships, Fine Arts/Practical Arts Credit and Equivalent Mathematics and Equally Rigorous Science Courses please refer to:

<http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.shtml>