Florida Department of Education
Curriculum Framework

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

Secondary – Career Preparatory	
Program Number	9204400
CIP Number	0648050807
Grade Level	9-12
Standard Length	5 credits
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	51-9198 – Helpers-Production Workers 51-4121 – Welders, Cutters, Solderers, and Brazers
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

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 five credits.

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 secondary program structure:

Course Number	Course Title	Teacher Certification	Length	SOC Code	Level	Graduation Requirement
9204410	Welding Technology Fundamentals 1	METAL WORK 7G WELDING @7 7G	1 credit		3	PA
9204420	Welding Technology Fundamentals 2		1 credit	51-9198	3	PA
9204430	Welding Technology Fundamentals 3		1 credit		3	PA
9204440	Welding Technology Fundamentals 4		1 credit	51-4121	3	PA
9204450	Welding Technology Fundamentals Capstone		1 credit	51-4121	3	

(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)

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 oxyfuel gas cutting principles and practices.
06.0 Demonstrate a basic understanding of shielded metal arc welding (SMAW).
07.0 Apply intermediate oxyfuel gas cutting principles and practices.
08.0 Demonstrate plasma arc cutting principles and practices.
09.0 Create a product using basic shielded metal arc welding (SMAW) principles and practices.
10.0 Apply basic shielded metal arc welding (SMAW) skills.
11.0 Demonstrate and apply Carbon Arc Gouging (GAC) principles and practices.
12.0 Apply visual examination skills.
13.0 Create a product using Carbon Arc Gouging and basic shielded metal arc welding (SMAW) principles and practices.
14.0 Demonstrate an understanding of employability skills and career opportunities related to the welding industry.
15.0 Apply intermediate shielded metal arc welding (SMAW) skills.
16.0 Create a product using intermediate shielded metal arc welding (SMAW) principles and practices
17.0 Conceive, design, and present a welding project(s) that encompass all the skills learned in the Welding Technology program.
18.0 Plan, organize, and carry out a project plan.
19.0 Formulate strategies to properly manage resources.
20.0 Use tools, materials, and processes in an appropriate and safe manner.
21.0 Create a project portfolio describing the welding project, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technology Fundamentals 1**
Course Number: **9204410**
Course Credit: **1**

Course Description:

The Welding Technology Fundamentals 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. Students demonstrate learned skills by creating and producing a finished product.

CTE Standards and Benchmarks
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 material handling techniques to safely move materials.
01.03 Demonstrate the proper techniques for lifting.
01.04 Explain Lock Out/Tag Out requirements procedures, including confined space awareness.
01.05 Proactively respond to a safety concern and notify the instructor.
01.06 Demonstrate knowledge of emergency exits and signage.
01.07 Demonstrate knowledge of various emergency alarms and procedures
01.08 Demonstrate knowledge of clean-up procedures.
01.09 Demonstrate knowledge of machinery and equipment safety functions to determine if all safeguards are operational.
01.10 Demonstrate knowledge of safety requirements for manual, electrical-powered, and pneumatic tools.
01.11 Perform safety and environmental inspections.
01.12 Demonstrate skill in performing leak checks to determine if toxic or hazardous material is escaping from a piece of equipment.

CTE Standards and Benchmarks	
	01.13 Demonstrate knowledge of proper and safe installation techniques as described in manuals, checklists, and regulations.
	01.14 Demonstrate knowledge of equipment shutdown procedures.
	01.15 Identify-safety related maintenance procedures.
	01.16 Selecting and use personal protective equipment (PPE).
	01.17 Demonstrate knowledge of ergonomic impact of work techniques.
	01.18 Apply Occupational Safety Health Administration (OSHA) safety standards properly.
	01.19 Research and identify class A, B, and C type fires.
	01.20 Demonstrate and apply the proper procedures for extinguishing class A, B, and C type fires.
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.
03.0	Describe and identify metals and their properties accurately.--The student will be able to:
	03.01 Describe and understand the steelmaking 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.
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.

CTE Standards and Benchmarks
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 oxyfuel 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 oxyfuel cutting equipment.
05.05 Perform straight cutting operations using manual oxyfuel cutting process on plain carbon steel.
06.0 Demonstrate a basic understanding of shielded metal arc welding (SMAW).--The student will be able to:
06.01 Perform external inspections of SMAW equipment and accessories.
06.02 Make minor repairs to SMAW equipment and accessories.
06.03 Set up shielded metal arc welding operations on plain carbon steel.
06.04 Operate shielded metal arc welding equipment.
06.05 Make pad welds, all positions, on plain carbon steel.

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technology Fundamentals 2**
Course Number: **9204420**
Course Credit: **1**

Course Description:

The Welding Technology Fundamentals 2 course is designed to build on the skills and knowledge students learned in Welding Technology Fundamentals 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). Students demonstrate learned skills by creating and producing a finished product.

CTE Standards and Benchmarks	
07.0	Apply intermediate oxyfuel gas cutting principles and practices.--The student will be able to:
07.01	Apply intermediate manual oxyfuel 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 oxyfuel 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 oxyfuel gas cutting (track burner) equipment.
07.10	Perform straight cutting operations on plain carbon steel.
07.11	Perform bevel cutting operations on plain carbon steel.
08.0	Demonstrate plasma arc cutting principles and practices.--The student will be able to:

CTE Standards and Benchmarks	
	08.01 Identify and describe common gages, shapes and dimensions of metals.
	08.02 Apply Manual Air (Plasma Arc Gouging) and Cutting (CAC-A) skills.
	08.03 Perform safety inspections of equipment and accessories.
	08.04 Make minor external repairs to equipment and accessories.
	08.05 Set up manual air carbon arc gouging and cutting operations.
	08.06 Operate manual air carbon arc cutting equipment.
	08.07 Perform metal removal operations.
	08.08 Apply manual Arc Gouging and Arc Cutting (AC) skills.
	08.09 Make minor repairs to equipment and accessories.
	08.10 Set up for using plasma arc cutting operations.
	08.11 Operate manual plasma arc cutting equipment.
	08.12 Perform shape cutting operations using plasma arc cutting process.
09.0	Create a product using oxyfuel gas cutting and introductory shielded metal arc welding (SMAW) principles and practices.--The student will be able to:
	09.01 Design and create a work of art or project utilizing material and skills learned.
	09.02 Create a working drawing or blue print using welding symbols.
	09.03 Design a product from a working drawing or blue print created.
	09.04 Fabricate a product using the skills learned related to oxyfuel gas cutting and introductory shielded metal arc welding (SMAW).
	09.05 Create and deliver a presentation to communicate project results.

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technology Fundamentals 3**
Course Number: **9204430**
Course Credit: **1**

Course Description:

The Welding Technology Fundamentals 3 course is designed to build on the skills and knowledge students learned in Welding Technology Fundamentals 1 and 2 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 basic shielded metal arc welding (SMAW), Carbon Arc Gouging (GAC) principles, and visual examination skills. Students demonstrate learned skills by creating and producing a finished product.

CTE Standards and Benchmarks
11.0 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.
11.08 Understand the processes of separating, forming, conditioning, fabricating, and finishing of materials.
11.09 Explain the difference between primary and secondary manufacturing processes.
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.

CTE Standards and Benchmarks	
	12.03 Properly set up equipment, accessories, and machine for Carbon Arc Gouging (GAC)
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.

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technology Fundamentals 4**
Course Number: **9204440**
Course Credit: **1**

Course Description:

The Welding Technology Fundamentals 4 course is designed to build on the skills and knowledge students learned in Welding Technology Fundamentals 1, 2, and 3 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 employability and welding careers, and intermediate shielded metal arc welding (SMAW). Students demonstrate learned skills by creating and producing a finished product.

CTE Standards and Benchmarks
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.

CTE Standards and Benchmarks	
	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.
	15.19 Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200).
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 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 Identify, understand, and describe thermal properties of metals.
	17.02 Design and create a work of art or project utilizing material and skills learned.
	17.03 Create a working drawing or blue print using welding symbols learned.
	17.04 Design a product from a working drawing or blue print created.
	17.05 Fabricate a product using the skills learned related to intermediate shielded metal arc welding (SMAW).
	17.06 Repair products of ferrous and non-ferrous metals.
	17.07 Create and deliver a presentation to communicate project results.

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technology Fundamentals Capstone**
Course Number: **9204450**
Course Credit: **1**

Course Description:

This course provides students with extended content and skills essential to the planning, design, creation, and presentation of a welding capstone project.

CTE Standards and Benchmarks	
18.0	Conceive, design, and present a welding project(s) that encompass all the skills learned in the Welding Technology Fundamentals program.--The student will be able to:
18.01	Create and produce an original working drawing using welding symbology.
18.02	Compose a well written design proposal and present to instructor for approval.
18.03	Incorporate principles and practices of oxyfuel gas cutting into the design.
18.04	Incorporate principles and practices of shielded metal arc welding (SMAW) into the design.
19.0	Plan, organize, and carry out a project plan.--The student will be able to:
19.01	Determine the scope of a project.
19.02	Organize tasks.
19.03	Determine project priorities.
19.04	Identify required resources.
19.05	Record project progress in a process journal.
19.06	Record and account for budget expenses during the life of the project.
19.07	Carry out the project plan to successful completion and delivery.
20.0	Formulate strategies to properly manage resources.--The student will be able to:
20.01	Identify required resources and associated costs for each stage of the project plan.

CTE Standards and Benchmarks	
	20.02 Create a project budget based on the identified resources.
	20.03 Determine the methods needed to acquire needed resources.
	20.04 Demonstrate good judgment in the use of resources.
	20.05 Recycle and reuse resources where appropriate.
	20.06 Demonstrate an understanding of proper legal and ethical waste disposal.
21.0	Use tools, materials, and processes in an appropriate and safe manner.--The student will be able to:
	21.01 Identify the proper tool for a given job.
	21.02 Use tools and machines in a safe manner.
	21.03 Adhere to laboratory safety rules and procedures.
	21.04 Identify the application of processes appropriate to the task at hand.
	21.05 Identify materials appropriate to their application.
22.0	Create a project portfolio describing the welding project, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results.--The student will be able to:
	22.01 Create a Design Portfolio documenting drawings and specifications.
	22.02 Create a Bill of Material (BOM) for your project.
	22.03 Create and deliver a presentation to communicate project results to other teams.

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.

Florida Standards for English Language Development (ELD)

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.ELL.SI.1

English Language Development (ELD) Standards Special Notes:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: http://www.cpalms.org/uploads/docs/standards/eld/SI.pdf.
For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the first 600 hrs. in the Welding Technology (J400400) postsecondary program.

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization for 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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan to meet individual needs and ensure equal access. 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular course or a modified course. If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

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.stml