

Welding Technology Mississippi Curriculum Framework

Program CIP: 48.0508 – Welding Technology/Welder

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ADOPTION OF NATIONAL CERTIFICATION STANDARDS

The **National Center for Construction Education and Research (NCCER)** is a not-for-profit 501(c)(3) education foundation created in 1996. It was developed with the support of more than 125 construction CEOs and various association and academic leaders who united to revolutionize training for the construction industry. Sharing the common goal of developing a safe and productive workforce, these companies created a standardized training and credentialing program for the industry. This progressive program has evolved into curricula for more than 70 craft areas and a complete series of more than 70 assessments offered in over 4,000 NCCER-accredited training and assessment locations across the United States.

NCCER develops standardized construction and maintenance curricula and assessments with portable credentials. These credentials are tracked through NCCER's National Registry which allows organizations and companies to track the qualifications of their craft professionals and/or check the qualifications of possible new hires. The National Registry also assists craft professionals by maintaining their records in a secure database.

NCCER's process of accreditation, instructor certification, standardized curriculum, national registry, assessment, and certification is a key component in the industry's workforce development efforts. NCCER also drives multiple initiatives to enhance career development and recruitment efforts for the industry. NCCER is headquartered in Alachua, FL, and is affiliated with the University of Florida's M.E. Rinker, Sr. School of Building Construction.

As the accrediting body for the industry, NCCER establishes the benchmark for quality training and assessments. By partnering with industry and academia, NCCER has developed a system for program accreditation that is similar to those found in institutions of higher learning. This process fosters national unity among the construction industry while providing a defined career path with industry-recognized credentials.

NCCER's accreditation process assures that students and craft professionals receive quality training based on uniform standards and criteria. These standards are outlined in the NCCER Accreditation Guidelines and must be adhered to by all NCCER Accredited Training Sponsors and Accredited Assessment Centers.

For more information related to implementing NCCER at your local campus, please visit <http://www.nccer.org/welding>.

The **American Welding Society (AWS) Foundation** was established by the American Welding Society on September 13, 1989, to support programs that ensure the growth and development of the welding industry through strengthening research and educational opportunities in welding and related industries.

From giving children their first glimmer of excitement in learning about the natural sciences, to providing funding for welding engineering undergraduates and fellowships for welding research, the AWS Foundation supports the welding industry. Led by a volunteer Board of Trustees, the Foundation is organized as a not-for-profit 501(c)(3) charitable organization. Administration, including program development, fundraising, public relations, marketing and financial management, is provided by a small development staff of the American Welding Society. Its operations are conducted from the Society's offices in Miami, Florida.

As the accrediting body for the industry, AWS establishes the benchmark for quality training and assessments. By partnering with industry and academia AWS has developed a system for program accreditation that is similar to those found in institutions of higher learning. This process fosters national unity among the construction industry while providing a defined career path with industry-recognized credentials.

AWS's accreditation process assures that students and craft professionals receive quality training based on uniform standards and criteria. These standards are outlined in the AWS Accreditation Guidelines and must be adhered to by all AWS Accredited Training Sponsors and Accredited Assessment Centers.

The welding competencies required in this curriculum were developed to coincide with the

Guide for the Training and Qualification of Welding Personnel:

- Entry-Level Welders (AWS EG2.0-95)
- Specification for Qualification & Certification for Entry-Level Welders (AWS QC 10-95)

Industry standards are based on the American Welding Society Standards EG2.0-95.

For more information related to implementing AWS at your local campus, please visit www.aws.org.

INDUSTRY JOB PROJECTION DATA

Welders, cutters, solderers, and brazers occupations require an education level of a long term on the job training and moderate term on-the-job training. There is a 7.67% increase in occupational demand at the regional level and an 8.50% increase at the state level. Median annual income for plumbers, pipefitters, and steamfitters is \$35,235.20 at the state and regional level. A summary of occupational data from the State Workforce Investment Board Data Center is displayed below:

Table 1: Education Level

Program Occupations	Education Level
Welders, Cutters, Solderers, and Brazers	Long-Term on-the-job training
Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	Moderate-Term on-the-job training

Table 2: Occupational Overview

	Region	State	United States
2010 Occupational Jobs	4,014	4,363	351,730
2020 Occupational Jobs	4,322	4,734	344,737
Total Change	308	371	-6993
Total % Change	7.67%	8.50%	-1.99%
2010 Median Hourly Earnings	\$16.56	\$17.28	\$16.82
2010 Median Annual Earnings	\$34,444.80	\$35,942.40	\$34,979.66
Annual Openings	30	37	-699

Table 3: Occupational Breakdown

Description	2010 Jobs	2020 Jobs	Annual Openings	2010 Hourly Earnings	2010 Annual Earnings 2,080 Work Hours
Welders, Cutters, Solderers, and Brazers	3,696	3,993	29	\$18.00	\$37,440.00
Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	318	329	1	\$15.12	\$31,449.60
TOTAL	4,014	4,322	30	\$16.56	\$34,444.80

Table 4: Occupational Change

Description	Regional Change	Regional % Change	State % Change	National % Change
Welders, Cutters, Solderers, and Brazers	297	8.04%	9.01%	-1.32%
Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	11	3.46%	2.62%	-7.54%

ARTICULATION

Articulation credit from Secondary Career Pathway programs to Postsecondary Welding Technology is available. Secondary students who have completed the articulated the Secondary Career Pathway Courses listed below may be awarded articulated college credit according to Mississippi Community College Board (MCCB) guidelines (<http://www.mccb.edu/pdfs/ct/StatewideArtManual201213.pdf>).

Articulated Secondary Course	Articulated Postsecondary Course	Aligned Industry Certification
CIP 48.0508 Welding Technology	WLT 1173 Introduction to Welding and Safety	NCCER Core

TECHNICAL SKILLS ASSESSMENT

Colleges should report the following for students who complete the program with a career certificate, technical certificate, or an Associate of Applied Science Degrees for technical skills attainment:

NCCER Core Assessment (\$45.00)
NCCER Welding Level 1 and 2 Credential (\$50.00 - \$100.00)

OR

NCCER NCCT Welding Level 1 (\$45.00)

OR

AWS Sense Level 1 (program certification fee - \$500 one-time fee; \$15.00 student fee)

OR

MS-CPAS2

ONLINE AND BLENDED LEARNING OPPORTUNITIES

Course content includes lecture and laboratory semester credit hours. Faculty members are encouraged to present lecture related content to students in an online or blended learning environment. Training related to online and blended learning will be available to faculty members through the MS Community College Board.

INSTRUCTIONAL STRATEGIES

The NCCER and AWS standards were adopted and provide instructional strategies to faculty members implementing the curriculum.

ASSESSMENT STRATEGIES

The NCCER and AWS Standards were adopted and provide assessment strategies to faculty member implementing the curriculum. Additionally, performance tasks were included in course content when appropriate.

CREDIT BY EXAMINATION

The following NCCER modules are aligned to courses listed below. Each module will serve as the state recommended exam to reward credit for prior learning experiences. Colleges have the local autonomy to create a college-level exam when awarding credit.

Course Number and Name	NCCER Credential and Module
WLT 1173 Introduction to Welding Safety	NCCER Core Curriculum Module 00101-09—Basic Safety Module 00102-09—Introduction to Construction Math Module 00103-09—Introduction to Hand Tools Module 00104-09—Introduction to Power Tools Module 00105-09—Introduction to Construction Drawing Module 00106-09—Basic Rigging Module 00107-09—Basic Communication Skills Module 00108-09—Basic Employability Skills Module 00109-09—Introduction to Materials Handling NCCER Welding Level 1 Module 29101-09—Welding Safety OR AWS Sense Level 1 Module 1: Occupational Orientation Module 2: Safety and Health of Welders

<p>WLT 1115 Shielded Metal Arc Welding I</p>	<p>NCCER Welding Level 1 Module 29105-09—Base Metal Preparation Module 29107-09—SMAW-Equipment and Setup Module 29108-09—Shielded Metal Arc Welding-Electrodes Module 29109-09—SMAW-Beads and Fillet Welds Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 4: Shielded Metal Arc Welding (SMAW) Module 9: Welding Inspection And Testing Key Indicators</p>
<p>WLT 1225 Shielded Metal Arc Welding II</p>	<p>NCCER Welding Level 1 Module 29110-09—Joint Fit-Up and Alignment Module 29111-09—SMAW- Groove Welds with Backing Module 29112-09—Open V-Groove Welds Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 4: Shielded Metal Arc Welding (SMAW) (<i>Continued from WLT 1115</i>) MODULE 9: WELDING INSPECTION AND TESTING KEY INDICATORS</p>
<p>WLT 1314 Cutting Processes</p>	<p>NCCER Welding Level 1 Module 29102-09—Oxyfuel Cutting Module 29103-09—Plasma Arc Cutting Module 29104-09—Air Carbon Arc Cutting and Gouging Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 8: Thermal Cutting Processes Module 9: Welding Inspection and Testing Key Indicators</p>
<p>WLT 1124 Gas Metal Arc Welding (GMAW)</p>	<p>NCCER Welding Level 2 (<i>Only GMAW components</i>) Module 29205-09—GMAW and FCAW: Equipment and Filler Metals Module 29206-09—GMAW and FCAW: Plate</p> <p>NCCER Welding Level 1 Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 5: Gas Metal Arc Welding (GMAW-S, GMAW Spray Transfer) Module 9: Welding Inspection And Testing Key Indicators</p>
<p>WLT 1143 Flux Cored Arc Welding (FCAW)</p>	<p>NCCER Welding Level 2 Module 29205-09—GMAW and FCAW: Equipment and Filler Metals Module 29206-09—GMAW and FCAW: Plate</p> <p>NCCER Welding Level 1 Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 6: Flux Cored Arc Welding (FCAW-G/GM, FCAW-S) Module 9: Welding Inspection And Testing Key Indicators</p>

<p>WLT 1135 Gas Tungsten Arc Welding (GTAW)</p>	<p>NCCER Welding Level 2 Module 29207-09—GTAW: Equipment and Filler Metals Module 29208-09—GTAW: Plate NCCER Welding Level 1 Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 7: Gas Tungsten Arc Welding (GTAW) Module 9: Welding Inspection and Testing Key Indicators</p>
<p>WLT 1232 Blueprint Reading, Welding Symbols, and Metallurgy</p>	<p>NCCER Welding Level 2 Module 29201-09—Welding Symbols Module 29202-09—Reading Welding Detail Drawings Module 29203-09—Physical Characteristics and Mechanical Properties of Metal Module 29204-09—Pre-heating and Post-Heating of Metals NCCER Welding Level 1 Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 3: Drawing and Welding Symbol Interpretation Module 9: Welding Inspection and Testing Key Indicators</p>

PROGRAM DESCRIPTION

The Welding and Cutting Technology program prepares students for entry level employment in the field of welding and cutting. The curriculum includes Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Flux Cored Arc Welding (FCAW), Plasma Arc Cutting (PAC), Carbon Arc Cutting, Oxyfuel Cutting, and Gas Tungsten Arc Welding (GTAW). Electives are available in advanced levels of welding and cutting.

The welding competencies required in this curriculum were developed to coincide with the Guide for the Training and Qualification of Welding Personnel: Entry-Level Welders (AWS EG2.0-95) and Specification for Qualification and Certification for Entry-Level Welders (AWS QC 10-95).

One major goal of this program is to prepare graduates to complete NCCER Core Curriculum, NCCER Level 1 and 2, or AWS Sense Level 1.

SUGGESTED COURSE SEQUENCE

Accelerated Career Pathway

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Clock Hours	Clock Hour Breakdown		Certification Information
			Lecture	Lab		Lecture	Lab	Certification Name
WLT 1173	Introduction to Welding and Safety	3	2	2	90	30	60	NCCER Core
WLT 1313	Cutting Processes	3	1	4	135	15	120	
	Approved Technical Electives	9						
TOTAL		15	3	6	225	45	180	

Career Certificate Required Courses

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Clock Hours	Clock Hour Breakdown		Certification Information
			Lecture	Lab		Lecture	Lab	Certification Name
WLT 1173	Introduction to Welding and Safety	3	2	2	90	30	60	NCCER Core
WLT 1115	Shield Metal Arc Welding I	5	1	8	255	15	240	NCCER Level 1
WLT 1225	Shield Metal Arc Welding II	5	1	8	255	15	240	
WLT 1313	Cutting Processes	3	1	4	135	15	120	
WLT 1124	Gas Metal Arc Welding	4	1	6	195	15	180	
WLT 1135	Gas Tungsten Arc Welding	5	1	8	255	15	240	
WLT 1143	Flux Cored Arc Welding	3	1	4	135	15	120	NCCER Level 2
WLT 1232	Blueprint Reading, Welding and Metallurgy	2	1	2	75	15	60	
TOTAL		30	9	42	1395	135	1260	

Technical Certificate Required Courses

Course Number	Course Name	Semester Credit Hours	SCH Breakdown		Total Clock Hours	Clock Hour Breakdown		Certification Information
			Lecture	Lab		Lecture	Lab	Certification Name
WLT 1155	Pipe Welding	5	1	8	255	15	240	
WLT 1252	Advanced Pipe Welding	2	1	2	75	15	60	
	Approved Technical Elective	8						
TOTAL		15	2	10	330	30	300	

General Education Core Courses

To receive the Associate of Applied Science Degree, a student must complete all of the required coursework found in the Career Certificate option, Technical Certificate option and a minimum of 15 semester hours of General Education Core. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester or provided primarily within the last semester. Each community college will specify the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college. The Southern Association of Colleges and Schools (SACS) Commission on Colleges Standard 2.7.3 from the Principles of Accreditation: Foundations for Quality Enhancement¹ describes the general education core.

Section 2.7.3 In each undergraduate degree program, the institution requires the successful completion of a general education component at the collegiate level that (1) is substantial component of each undergraduate degree, (2) ensures breadth of knowledge, and (3) is based on a coherent rationale. For degree completion in associate programs, the component constitutes a minimum of 15 semester hours or the equivalent. These credit hours are to be drawn from and include at least one course from the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics. The courses do not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession.

¹

Southern Association of Colleges and Schools Commission on Colleges. (2012). *The principles of accreditation: Foundations for quality enhancement*. Retrieved from <http://www.sacscoc.org/pdf/2012PrinciplesOfAccreditation.pdf>

Technical Electives

Course Number	Course Name	Semester Credit Hours	SCH Breakdown			Total Clock Hours	Clock Hour Breakdown			Certification Information
			Lecture	Lab	Clinical/ Internship		Lecture	Lab	Clinical/ Internship	Certification Name
WLT 1162	Gas Metal Arc Aluminum Welding	2	1	2		75	15	60		
WLT 192(1-6)	Supervised Work Experience in Welding and Cutting Tech	1-6			3-18	135-810			135-810	
WLT 2812	Welding Metallurgy	2	2	0		30	30			
WLT 2913	Welding Code	3	3			45	45			
DDT 1114	Fundamentals of Drafting	4	2	4		150	30	120		
PPV 1426	Basic Fabrication of Pipefitting	6	2	8		270	30	240		
PPV 1823	Steel Ship Building and Marine Construction	3	2	2		90	30	60		
WLT 2514	Fundamentals of Robotic Welding	4	2	4		150	30	120		
WLT 2524	Advanced Robotic Welding	4	2	4		150	30	120		
WLT 191(1-6)	Special Problem in Welding and Cutting Technology	1-6		2-12		60-360		60-360		
IMM 1935	Manufacturing Skills Basic	5	2	6		210	30	180		
WLT 1931	Welding Seminar I	1		2		60		60		
WLT 1941	Welding Seminar II	1		2		60		60		
WBL 191(1-3) WBL 192(1-3) WBL 193(1-3) WBL 291(1-3) WBL 292(1-3) WBL 293(1-3)	Work-Based Learning	1-6			3-18	135-810			135-810	
	Other Instructor Approved Elective(s)									

CAREER CERTIFICATE REQUIRED COURSES

Course Number and Name: WLT 1173 Introduction to Welding and Safety

Classification: Career Certificate Core Requirement

Description: This course is designed to give student an introduction to the welding profession and experience in safety procedures related to welding.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	2	2	90

National Assessment: NCCER Core Curriculum, selected modules from NCCER Level 1 or AWS Modules 1 & 2

Prerequisite: None

Student Learning Outcomes:

NCCER Core

Module 00101-09--Basic Safety

1. Explain the idea of a safety culture and its importance in the construction crafts.
2. Identify causes of accidents and the impact of accident costs.
3. Explain the role of OSHA in job-site safety.
4. Explain OSHA's General Duty Clause and 1926 CFR Subpart C.
5. Recognize hazard recognition and risk assessment techniques.
6. Explain fall protection, ladder, stair, and scaffold procedures and requirements.
7. Identify struck-by hazards and demonstrate safe working procedures and requirements.
8. Identify caught-in-between hazards and demonstrate safe working procedures and requirements.
9. Define safe work procedures to use around electrical hazards.
10. Demonstrate the use and care of appropriate personal protective equipment (PPE).
11. Explain the importance of hazard communications (HazCom) and material safety data sheets (MSDSs).
12. Identify other construction hazards on your job site, including hazardous material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires.

Module 00102-09--Introduction to Construction Math

1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.
2. Use a standard ruler, a metric ruler, and a measuring tape to measure.
3. Add, subtract, multiply, and divide fractions.
4. Add, subtract, multiply, and divide decimals, with and without a calculator.
5. Convert decimals to percentages and percentages to decimals.
6. Convert fractions to decimals and decimals to fractions.
7. Explain what the metric system is and how it is important in the construction trade.
8. Recognize and use metric units of length, weight, volume, and temperature.
9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.

Module 00103-09--Introduction to Hand Tools

1. Recognize and identify some of the basic hand tools and their proper uses in the construction trade.
2. Visually inspect hand tools to determine if they are safe to use.
3. Safely use hand tools.

Module 00104-09--Introduction to Power Tools

1. Identify power tools commonly used in the construction trades.
2. Use power tools safely.
3. Explain how to maintain power tools properly.

Module 00105-09--Introduction to Construction Drawings

1. Recognize and identify basic construction drawing terms, components, and symbols.
2. Relate information on construction drawings to actual locations on the print.
3. Recognize different classifications of construction drawings.
4. Interpret and use drawing dimensions.

Module 00106-09--Basic Rigging

1. Identify and describe the use of slings and common rigging hardware.
2. Describe basic inspection techniques and rejection criteria used for slings and hardware.
3. Describe basic hitch configurations and their proper connections.
4. Describe basic load-handling safety practices.
5. Demonstrate proper use of American National Standards Institute (ANSI) hand signals.

Module 00107-09--Basic Communication Skills

1. Interpret information and instructions presented in both verbal and written form.
2. Communicate effectively in on-the-job situations using verbal and written skills.
3. Communicate effectively on the job using electronic communication devices.

Module 00108-09--Basic Employability Skills

1. Explain your role as an employee in the construction industry.
2. Demonstrate critical thinking skills and the ability to solve problems using those skills.
3. Demonstrate knowledge of computer systems and explain common uses for computers in the construction industry.
4. Define effective relationship skills.
5. Recognize workplace issues such as sexual harassment, stress, and substance abuse.

Module 00109-09--Introduction to Materials Handling

1. Define a load.
2. Establish a pre-task plan prior to moving a load.
3. Use proper materials-handling techniques.
4. Choose appropriate materials-handling equipment for the task.
5. Recognize hazards and follow safety procedures required for materials handling.

NCCER Welding Level 1**Module 29101-09-Welding Safety**

1. Identify some common hazards in welding.
2. Explain and identify proper personal protection used in welding.
3. Describe how to avoid welding fumes.
4. Explain some of the causes of accidents.
5. Identify and explain uses for material safety data sheets.
6. Explain safety techniques for storing and handling cylinders.
7. Explain how to avoid electric shock when welding.
8. Describe proper material handling methods.

OR

AWS Sense Welding Level 1

Module 1: Occupational Orientation

1. Prepares time or job cards, reports or records.
2. Performs housekeeping duties.
3. Follows verbal instructions and complete work assignments.
4. Follows written instructions to complete work assignments.

Module 2: Safety and Health of Welders

1. Demonstrates proper use and inspection of personal protection equipment (PPE).
2. Demonstrates proper safe operation practices in work areas.
3. Demonstrates proper use and inspection of ventilation equipment.
4. Demonstrates proper HotZone operation.
5. Demonstrate proper work actions for working in confined spaces.
6. Demonstrate proper use of precautionary labeling and MSDS information.
7. Demonstrate proper inspection and operation of equipment use for each welding and thermal cutting process. (Tills are best done as part of the process module/unit for each of the required welding and thermal cutting processes.)

Course Number and Name: WLT 1115 Shielded Metal Arc Welding I

Classification: Career Certificate Core Requirement

Description: This course is designed to teach students introductory welding techniques using the SMAW process.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
5	1	8	255

National Assessment: Selected Modules of NCCER Welding Level 1 or AWS Sense Level 1

Prerequisite: None

Student Learning Outcomes:

NCCER Welding Level 1

Module 29105-09—Base Metal Preparation

1. Clean base metal for welding or cutting.
2. Identify and explain joint design.
3. Explain joint design considerations.
4. Mechanically bevel the edge of a mild steel plate.
5. Thermally bevel the end of a mild steel plate.
6. Select the proper joint design based on a welding procedure specification (WPS) or instructor direction.

Module 29107-09—SMAW-Equipment and Setup

1. Identify and explain shielded metal arc welding (SMAW) safety.
2. Explain welding electrical current.
3. Identify welding power supplies and their characteristics.
4. Explain how to set up welding power supplies.
5. Set up a machine for welding.
6. Identify tools used for weld cleaning.

Module 29108-09—Shielded Metal Arc Welding-Electrodes

1. Identify factors that affect electrode selection.
2. Explain the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME) filler metal classification system.
3. Identify different types of filler metals.
4. Explain the storage and control of filler metals.
5. Explain filler metal traceability requirements and how to use applicable code requirements.
6. Identify and select the proper electrode for an identified welding task.

Module 29109-09—SMAW-Beads and Fillet Welds

1. Set up shielded metal arc welding (SMAW) equipment.
2. Describe methods of striking an arc.
3. Properly strike and extinguish an arc.
4. Describe causes of arc blow and wander.
5. Make stringer, weave, and overlapping beads.
6. Make fillet welds in the following positions: Horizontal (2F), Vertical (3F), Overhead (4F)

NCCER Welding Level 1**Module 29106-09—Weld Quality**

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1**Module 4: Shielded Metal Arc Welding (SMAW)**

1. Performs safety inspections of SMAW equipment and accessories.
2. Makes minor external repairs to SMAW equipment and accessories.
3. Sets up for SMAW operations on carbon steel.
4. Operates SMAW equipment on carbon steel.
5. Makes fillet weld in all positions on carbon steel.
6. Makes groove welds, in all positions, on carbon steel.
7. Passes SMAW welder performance qualifications test (2G and 3G, uphill, limited thickness test plates) on carbon steel.

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 1225 Shielded Metal Arc Welding II

Classification: Career Certificate Core Requirement

Description: This course is designed to teach students advanced welding techniques using the SMAW process.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
5	1	8	255

National Assessment: Selected Modules of NCCER Welding Level 1 or AWS Sense Level 1

Prerequisite: None

Student Learning Outcomes:

NCCER Welding Level 1

Module 29110-09—Joint Fit-Up and Alignment

1. Identify and explain job code specifications.
2. Use fit-up gauges and measuring devices to check joint fit-up.
3. Identify and explain distortion and how it is controlled.
4. Fit up joints using plate and pipe fit-up tools.
5. Check for joint misalignment and poor fit-up before and after welding.

Module 29111-09—SMAW- Groove Welds with Backing

1. Identify and explain groove welds.
2. Identify and explain groove welds with backing.
3. Set up shielded metal arc welding (SMAW) equipment for making V-groove welds.
4. Perform SMAW for V-groove welds with backing in the following: Flat (1G), Horizontal (2G), Vertical (3G), Overhead (4G)

Module 29112-09—Open V-Groove Welds

1. Prepare shielded metal arc welding (SMAW) equipment for open-root V-groove welds.
2. Perform open-root V-groove welds in the following positions: Flat (1G), Horizontal (2G), Vertical (3G), Overhead (4G)

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 4: Shielded Metal Arc Welding (SMAW) *(Continued from WLT 1115)*

1. Performs safety inspections of SMAW equipment and accessories.
2. Makes minor external repairs to SMAW equipment and accessories.
3. Sets up for SMAW operations on carbon steel.
4. Operates SMAW equipment on carbon steel.

5. Makes fillet weld in all positions on carbon steel.
6. Makes groove welds, in all positions, on carbon steel.
7. Passes SMAW welder performance qualifications test (2G and 3G, uphill, limited thickness test plates) on carbon steel.

MODULE 9: WELDING INSPECTION AND TESTING KEY INDICATORS

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 1313 Cutting Processes

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student experience in oxyfuel cutting principles and practices, air carbon cutting and gouging, and plasma arc cutting.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	1	4	135

National Assessment: Selected Modules of NCCER Welding Level 1 or AWS Sense Level 1

Prerequisite: None

Student Learning Outcomes:

NCCER Welding Level 1

Module 29102-09—Oxyfuel Cutting

1. Identify and explain the use of oxyfuel cutting equipment.
2. Set up oxyfuel equipment.
3. Light and adjust an oxyfuel torch.
4. Shut down oxyfuel cutting equipment.
5. Disassemble oxyfuel equipment.
6. Change cylinders.
7. Perform oxyfuel cutting (straight line and square shapes, piercing and slot cutting, bevels, washing, gouging)
8. Operate a motorized, portable oxyfuel gas cutting machine.

Module 29103-09—Plasma Arc Cutting

1. Explain the plasma arc cutting processes.
2. Identify plasma arc cutting equipment.
3. Prepare and set up plasma arc cutting equipment.
4. Use plasma arc cutting equipment to make various types of cuts.
5. Properly store equipment and clean the work area after use.

Module 29104-09—Air Carbon Arc Cutting and Gouging

1. Identify and explain the air carbon arc cutting (CAC-A) process and equipment.
2. Select and install CAC-A electrodes.
3. Prepare the work area and CAC-A equipment for safe operation.
4. Use CAC-A equipment for washing and gouging activities.
5. Perform storage and housekeeping activities for CAC-A equipment.
6. Make minor repairs to CAC-A equipment.

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 8: Thermal Cutting Processes

Manual Oxyfuel Gas Cutting (OFC)

1. Performs safety inspections of manual OFC equipment and accessories.
2. Makes minor external repairs to manual OFC equipment and accessories.
3. Sets up for manual OFC operations on carbon steel.
4. Operates manual OFC equipment on carbon steel.
5. Performs straight, square edge cutting operations, in the flat position, on carbon steel.
6. Performs shape, square edge cutting operations, in the flat position, on carbon steel.
7. Performs straight, bevel edge cutting operations, in the flat position, on carbon steel.
8. Performs scarfing and gouging operations to remove base and weld metal, in the flat and horizontal positions, on carbon steel.

Mechanized Oxyfuel Gas Cutting (OFC) [E.G., Track Burner]

1. Performs safety inspections of mechanized OFC equipment and accessories.
2. Makes minor external repairs to mechanized OFC equipment and accessories.
3. Sets up for mechanized OFC operations on carbon steel.
4. Operates mechanized OFC equipment on carbon steel.
5. Performs straight, square edge cutting operations in the flat position, on carbon steel.
6. Performs straight, bevel edge cutting operations in the flat position, on carbon steel.

Manual Plasma Arc Cutting (PAC)

1. Performs safety inspections of manual PAC equipment and accessories.
2. Makes minor external repairs to manual PAC equipment and accessories.
3. Sets up for manual PAC operations on carbon steel, austenitic stainless steel, and aluminum.
4. Operates manual PAC equipment on carbon steel, austenitic stainless steel, and aluminum.
5. Performs straight, square edge cutting operations, in the flat position, on carbon steel, austenitic stainless steel, and aluminum.
6. Performs shape, square edge cutting operations, in the flat position, on carbon steel, austenitic stainless steel and aluminum.

Manual Air Carbon Arc Cutting (CAC-A) Key Indicators

1. Performs safety inspections of manual CAC-A equipment and accessories.
2. Makes minor external repairs to manual CAC-A equipment and accessories.
3. Sets up for manual CAC-A scarfing and gouging operations on carbon steel.
4. Operates manual CAC-A equipment on carbon steel.
5. Performs scarfing and gouging operations to remove base and weld metal, in the flat and horizontal positions, on carbon steel.

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 1124 Gas Metal Arc Welding (GMAW)

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student experience in various welding applications with the GMAW process using various modes of transfer.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	1	6	195

National Assessment: Selected Modules of NCCER Welding Level 1 and 2 or AWS Sense Level 1

Prerequisite: None

Student Learning Outcomes:

NCCER Welding Level 2 (*Students will only focus on GMAW process of the following NCCER Standards.*)

Module 29205-09—GMAW and FCAW: Equipment and Filler Metals

1. Explain gas metal arc welding (GMAW) and flux-cored arc welding (FCAW) safety.
2. Explain the characteristics of welding current and power sources.
3. Identify and explain the use of GMAW and FCAW equipment: Spray transfer, Globular, Short circuiting, Pulse.
4. Identify and explain the use of GMAW and FCAW shielding gases and filler metals.
5. Set up GMAW and FCAW equipment and identify tools for weld cleaning.

Module 29206-09—GMAW and FCAW: Plate

1. Perform GMAW-S (short-circuit) multiple-pass fillet welds on carbon steel plate coupons in multiple positions, using solid or composite wire and shielding gas.
2. Perform GMAW-S (short-circuit) multiple-pass V-groove welds on carbon steel plate coupons in multiple positions (with or without backing), using solid or composite wire and shielding gas.
3. Perform GMAW spray fillet and V-groove welds on carbon steel plate coupons in multiple positions (with or without backing), using solid or composite wire and shielding gas.
4. Perform FCAW multiple-pass fillet welds on carbon steel plate coupons in multiple positions, using flux-cored wire and, if required, shielding gas.
5. Perform FCAW multiple-pass V-groove welds on carbon steel plate coupons in multiple positions (with or without backing), using flux-cored wire and, if required, shielding gas.

NCCER Welding Level 1

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 5: Gas Metal Arc Welding (GMAW-S, GMAW Spray Transfer)

1. Performs safety inspections of GMAW equipment and accessories.
2. Makes minor external repairs to GMAW equipment and accessories.
3. Short Circuiting Transfer
4. Sets up for GMAW-S operations on carbon steel.
5. Operates GMAW-S equipment on carbon steel.
6. Makes fillet welds in all positions on carbon steel.
7. Makes groove welds in all positions on carbon steel.
8. Passes GMAW-S welder performance qualification test on carbon steel.
9. Spray Transfer
10. Sets up for GMAW (spray) operations on carbon steel.
11. Operates GMAW (spray) equipment on carbon steel.
12. Makes fillet welds in the 1F and 2F positions on carbon steel.
13. Makes groove welds in the 1G position on carbon steel.
14. Passes GMAW (spray) welder performance qualification test on carbon steel.

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 1143 Flux Cored Arc Welding (FCAW)

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student experience using FCAW process.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	1	4	135

National Assessment: Selected Modules of NCCER Welding Level 1 and 2 *or* AWS Sense Level 1

Prerequisite: None

Student Learning Outcomes:

NCCER Welding Level 2 (*Students will only focus on FCAW process of the following NCCER Standards.*)

Module 29205-09—GMAW and FCAW: Equipment and Filler Metals

1. Explain gas metal arc welding (GMAW) and flux-cored arc welding (FCAW) safety.
2. Explain the characteristics of welding current and power sources.
3. Identify and explain the use of GMAW and FCAW equipment: Spray transfer, Globular, Short circuiting, Pulse
4. Identify and explain the use of GMAW and FCAW shielding gases and filler metals.
5. Set up GMAW and FCAW equipment and identify tools for weld cleaning.

Module 29206-09—GMAW and FCAW: Plate

1. Perform GMAW-S (short-circuit) multiple-pass fillet welds on carbon steel plate coupons in multiple positions, using solid or composite wire and shielding gas.
2. Perform GMAW-S (short-circuit) multiple-pass V-groove welds on carbon steel plate coupons in multiple positions (with or without backing), using solid or composite wire and shielding gas.
3. Perform GMAW spray fillet and V-groove welds on carbon steel plate coupons in multiple positions (with or without backing), using solid or composite wire and shielding gas.
4. Perform FCAW multiple-pass fillet welds on carbon steel plate coupons in multiple positions, using flux-cored wire and, if required, shielding gas.
5. Perform FCAW multiple-pass V-groove welds on carbon steel plate coupons in multiple positions (with or without backing), using flux-cored wire and, if required, shielding gas.

NCCER Welding Level 1

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 6: Flux Cored Arc Welding (FCAW-G/Gm, FCAW-S)

1. Performs safety inspections of FCAW equipment and accessories.
2. Makes minor external repairs to FCAW equipment and accessories.

Gas Shielded

3. Sets up for FCAW-G/GM operations on carbon steel.
4. Operates FCAW-G/GM equipment on carbon steel.
5. Makes fillet welds in all positions on carbon steel.
6. Makes groove welds in all positions on carbon steel.
7. Passes FCAW-G/GM welder performance qualification test on carbon steel

Self-Shielded

8. Sets up for FCAW-S operations on carbon steel.
9. Operates FCAW-S equipment on carbon steel.
10. Makes fillet welds in all positions on carbon steel.
11. Makes groove welds in all positions on carbon steel.
12. Passes FCAW-S welder performance qualification test on carbon steel.

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 1135 Gas Tungsten Arc Welding (GTAW)

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student experience in various welding applications using the GTAW process.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
5	1	8	255

National Assessment: Selected Modules of NCCER Welding Level 1 and 2 or AWS Sense Level 1

Prerequisite: None

Student Learning Outcomes:

NCCER Welding Level 2

Module 29207-09—GTAW: Equipment and Filler Metals

1. Explain gas tungsten arc welding (GTAW) safety.
2. Identify and explain the function of GTAW equipment.
3. Identify and explain the function of GTAW filler metals.
4. Identify and explain the function of GTAW shielding gases.
5. Set up GTAW equipment.

Module 29208-09—GTAW: Plate

1. Build a pad in the flat position with stringer beads using GTAW and carbon steel filler metal.
2. Perform multiple-pass GTAW fillet welds on carbon steel plate coupons in the following positions, using carbon steel filler metal: 1F, 2F, 3F, 4F
3. Perform multiple-pass GTAW V-groove welds on carbon steel plate coupons in the following positions, using carbon steel filler metal: 1G, 2G, 3G, 4G

NCCER Welding Level 1

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 7: Gas Tungsten Arc Welding (GTAW)

1. Performs safety inspections of GTAW equipment and accessories.
2. Makes minor external repairs to GTAW equipment and accessories.

Carbon Steel

3. Sets up for GTAW operations on carbon steel.
4. Operates GTAW equipment on carbon steel.
5. Makes fillet welds in all positions on carbon steel.
6. Makes groove welds in all positions on carbon steel.
7. Passes GTAW welder performance qualification test on carbon steel.

Austenitic Stainless Steel

8. Sets up for GTAW operations on austenitic stainless steel.
9. Operates GTAW equipment on austenitic stainless steel.
10. Makes fillet welds in the 1F, 2F, and 3F positions, on austenitic stainless steel.
11. Makes groove welds in the 1G and 2G positions, on austenitic stainless steel.
12. Passes GTAW welder performance qualification test on austenitic stainless steel.

Aluminum

13. Sets up for GTAW operations on aluminum.
14. Operates GTAW equipment on aluminum.
15. Makes fillet welds in the 1F and 2F positions, on aluminum.
16. Makes groove welds in the 1G position, on aluminum.
17. Passes GTAW welder performance qualification test on aluminum.

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 1232 **Blueprint Reading, Welding Symbols, and Metallurgy**

Classification: Career Certificate Core Requirement

Description: This course is designed to give the student experience in blueprint reading, welding symbols, and metallurgy.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
2	1	2	75

National Assessment: Selected Modules of NCCER Welding Level 1 and 2 or AWS Sense Level 1

Prerequisite: None

Student Learning Outcomes:

NCCER Welding Level 2

Module 29201-09—Welding Symbols

1. Identify and explain the various parts of a welding symbol.
2. Identify and explain fillet and groove weld symbols.
3. Read welding symbols on drawings, specifications, and welding procedure specifications.
4. Interpret welding symbols from a print.

Module 29202-09—Reading Welding Detail Drawings

1. Identify and explain a welding detail drawing.
2. Identify and explain lines, material fills, and sections.
3. Identify and explain object views.
4. Identify and explain dimensioning.
5. Identify and explain notes and bill of materials.
6. Interpret basic elements of a welding detail drawing.
7. Sketch or draw basic welding drawings.

Module 29203-09—Physical Characteristics and Mechanical Properties of Metal

1. Identify and explain the composition and classification of base metals.
2. Explain and demonstrate field identification methods for base metals.
3. Identify and explain the physical characteristics and mechanical properties of metals.
4. Identify and explain forms and shapes of structural metals.
5. Explain metallurgical considerations for welding metals.

Module 29204-09—Pre-heating and Post-Heating of Metals

1. Explain and demonstrate how to preheat metals.
2. Describe maintaining interpass temperature.
3. Explain post-weld heat treatment of metals.
4. Explain the effects of preheat and post-heat on metals: Heat-affected zone (HAZ), Cracking, Grain or crystal structure.
5. Relate information on construction drawings to actual locations on the print.
6. Recognize different classifications of construction drawings.
7. Interpret and use drawing dimensions.

NCCER Welding Level 1

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.

4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 3: Drawing and Welding Symbol Interpretation

1. Interprets basic elements of a drawing or sketch.
2. Interprets welding symbol information.
3. Fabricates parts from a drawing or sketch

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Supplemental/Reinforcement Material:

NCCER Welding Core Curriculum

Module 00105-09--Introduction to Construction Drawings

1. Recognize and identify basic construction drawing terms, components, and symbols.
2. Relate information on construction drawings to actual locations on the print.
3. Recognize different classifications of construction drawings.
4. Interpret and use drawing dimensions.

TECHNICAL CERTIFICATE REQUIRED COURSES

Course Number and Name: WLT 1155 Pipe Welding

Classification: Technical Certificate Core Requirement

Description: This course is designed to give the student experience in pipe welding procedures.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
5	1	8	255

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Demonstrate safety precautions, and identify pipe weld test positions.
2. Describe differences in pipe and tubing and describe faults in pipe welding.
3. Use correct methods for preparation and fitting of pipe, and demonstrate correct pipe welding procedures.
4. Perform open V-grooved pipe welds and bend tests.
 - a. Fabricate and weld a 2G and 5G open root V-grooved pipe weld using multiple positions using E-6010, E-7018, or other instructor approved electrodes.
 - b. Pass a 6G guided bend test on an open root.

AND

NCCER Welding Level 1

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 1252 **Advanced Pipe Welding**

Classification: Technical Certificate Core Requirement

Description: This course is designed to give the student advanced pipe welding techniques using shielded metal arc and gas tungsten arc welding processes.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
2	1	2	75

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Fabricate and weld pipe according to specifications using multiple positions.
 - a. Fabricate and weld an open root V-grooved pipe weld using the downhill technique.
 - b. Fabricate and weld an open root V-grooved multiple diameter pipe weld utilizing the GTAW process.

2. Perform open butt V-groove pipe welds using multiple positions and bend tests.
 - a. Fabricate and weld an open root V-grooved pipe weld using GTAW and E-7018 electrodes.
 - b. Pass a 6G guided bend test on open root V-grooved pipe weld using GTAW and E-7018 electrodes as per AWS D1.1 Code.

AND

NCCER Welding Level 1

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
8. Identify common destructive testing methods.
9. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

TECHNICAL ELECTIVE COURSES

Course Number and Name: WLT 1162 Gas Metal Arc Aluminum Welding

Classification: Technical Elective

Description: This course is designed to give the student experience in Gas Metal Aluminum Welding.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
2	1	2	75

National Assessment: None

Pre-requisite: Instructor Approved

Student Learning Outcomes:

1. Identify aluminum alloys, aluminum weld ability, and results of welding aluminum.
 - a. List advantages of aluminum alloys.
 - b. Identify factors that make aluminum difficult to weld.
2. Perform multi-pass welds.
 - a. Fabricate and weld multi-pass fillet welds.
 - b. Fabricate and weld 2G and 3G V-grooved butt joint.

AND

NCCER Welding Level 1

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 2812 Welding Metallurgy

Classification: Technical Elective

Description: This course is designed to give the student experience in the concept of metallurgy and how metals react to internal and external strains and temperature changes.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
2	2	0	30

National Assessment: None

Prerequisite: None

Student Learning Outcomes:

1. Explore metals and effect that heat has on these metals.
 - a. Identify different types of metals by ASTM classification, and describe the characteristics and uses.
 - b. Identify the effect different ranges of heat have on base metal.
 - c. Identify the different structures of metal.
2. Explore the use hardness testing equipment.
 - a. Identify and describe the use of hardness testing equipment.
 - b. Safely perform hardness testing procedures.
3. Explore the Heat Affected Zone on weldments.
 - a. Describe the effect of the heat input on the weld area.
 - b. Describe methods of prevention and correction of damage to the base metal.

AND

NCCER Welding Level 1

Module 29106-09—Weld Quality

1. Identify and explain codes governing welding.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
4. Identify common destructive testing methods.
5. Perform a visual inspection of fillet welds.

OR

AWS Sense Welding Level 1

Module 9: Welding Inspection and Testing Key Indicators

1. Examines cut surfaces and edges of prepared base metal parts.
2. Examines tacks, root passes, intermediate layers, and completed welds.

Course Number and Name: WLT 2913 Welding Code

Classification: Technical Elective

Description: This course is designed to give the student experience in the various welding codes and the experience in interpretation of these codes.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	3	0	45

National Assessment: None

Prerequisite: None

Student Learning Outcomes:

1. Explore AWS D1.1 Code.
 - a. Examine how WPSs, PQRs, and WQTR are relevant to code.
 - b. Examine various weld joints and weld configurations.
 - c. Examine base materials and electrodes related to processes used under code provisions.
2. Explore API 1104 Code.
 - a. Examine how WPSs, PQRs, and WQTR are relevant to code.
 - b. Examine various weld joints and weld configurations.
 - c. Examine base materials and electrodes related to processes used under code provisions.
3. Explore ASME Section 9 Code.
 - a. Examine how WPSs, PQRs, and WQTR are relevant to code.
 - b. Examine various weld joints and weld configurations.
 - c. Examine base materials and electrodes related to processes used under code provisions.

Course Number and Name: **WLT 1426 Basic Fabrication for Pipefitting**

Classification: Technical Elective

Description: This course is designed for the use of pipefitting tools and equipment, different ways of cutting and fitting pipes, methods of calculating pipe fittings, and various types of fit-ups for different types of pipe.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
6	2	8	270

National Assessment: None

Prerequisite: None

Student Learning Outcomes:

1. Explain and identify the use of various pipefitting tools and equipment.
 - a. Explain the safe use of tools and equipment.
 - b. Identify the proper tools for each specific task.
 - c. Identify and explain the use of the equipment for each specific task.

2. Describe and fabricate various pipe assemblies.
 - a. Describe methods for preparing different types of pipe for fabrication.
 - b. Estimate fitting take-out.
 - c. Fabricate a butt weld pipe assembly.
 - d. Fabricate a socket weld pipe assembly.
 - e. Fabricate a screw pipe assembly.
 - f. Fabricate a piping assembly from a blueprint.
 - g. Fabricate a pipe hanger.

Course Number and Name: **WLT 2514 Fundamentals of Robotic Welding**

Classification: Technical Elective

Description: This course is designed to introduce the student to industrial robots. Topics to be covered include robotics history, industrial robot configurations, operation, and basic programming.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	150

National Assessment: None

Prerequisite: None

Student Learning Outcomes:

1. Describe the various major components of all robots.
 - a. Explain the axes of movement.
 - b. Label each major component.
 - c. Identify four general types of work envelopes.
 - d. Discuss three general forms of robot actuation.
 - e. Identify different types of input devices used with robot controllers.
 - f. Describe the characteristics of a robot that distinguish it from other types of automated machinery.

2. Demonstrate safety procedures used in the automated environment.
 - a. Apply safety rules for personal and general shop safety including eye, ear, and body protection; general rules of shop conduct; and the use of safety color coding.
 - b. Apply general safety rules for tool and equipment use including hand tools, air and electric power tools, and other shop equipment.
 - c. Apply general safety rules associated with working on various robotics systems.
 - d. Apply rules and procedures associated with fire safety including procedures for handling and storing flammable liquids and proper use of firefighting devices.

3. Demonstrate the ability to operate robots.
 - a. Evaluate robot performance.
 - b. Apply basic programming skills.
 - c. Identify and discuss end effectors.
 - d. Identify and discuss visual and tactile sensors.
 - e. Demonstrate basic troubleshooting techniques.

Course Number and Name: **WLT 2524 Advanced Robotic Welding**

Classification: Technical Elective

Description: This course teaches the operating systems and advanced programming methods of industrial robots. Actual industrial grade robots are used to train the student in the areas of operation, maintenance, troubleshooting, service procedures, and robotics applications.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	150

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Demonstrate the ability to integrate a robot into a process.
 - a. Write programs on industrial robots to perform simulated industrial processes to operate within the confines of each robot’s work envelope.
 - b. Demonstrate the improvement of the efficiency of an automated robotics process by reducing cycle time, decreasing memory usage, using advanced programming techniques, and so forth.

2. Demonstrate the ability to integrate peripheral equipment.
 - a. Program and interface peripheral devices such as a programmable logic controller into robotics work cells.
 - b. Interface contact and non-contact sensors into robotics work cell.

3. Demonstrate the ability to troubleshoot and maintain a robotics work cell.
 - a. Locate and isolate faults in robotics applications.
 - b. Demonstrate the use of test equipment and troubleshooting logic to repair faults.
 - c. Perform routine maintenance procedures on robots with the use of checklists and service equipment (null servo valves, zero encoders, calibrate potentiometers, etc.).

Course Number and Name: WLT 191(1-6) Special Problem in Welding and Cutting Technology

Classification: Technical Elective

Description: A course to provide students with an opportunity to utilize skills and knowledge gained in other Welding and Cutting Technology courses. The instructor and student work closely together to select a topic and establish criteria for completion of the project.

Hour Breakdown:

Scheduled Hours	Lab	Clock Hours
1	2	60
2	4	120
3	6	180
4	8	240
5	10	300
6	12	360

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Develop a written plan that details the activities and projects to be completed.
 - a. Use a written plan that details the activities and projects to be completed.
 - b. Perform written occupational objectives in the special problem.
2. Assess accomplishment of objectives.
 - a. Prepare daily written assessments of accomplishment of objectives.
 - b. Present weekly written reports to the instructor of activities performed and objectives accomplished.
3. Use and follow a set of written guidelines for the special problem.
 - a. Develop and follow a set of written guidelines for the special problem.

Course Number and Name: WLT 192(1-6) Supervised Work Experience in Welding and Cutting Technology

Classification: Technical Elective

Description: A course that is a cooperative program between industry and education designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of one semester hour per 45 industrial contact hours.

Hour Breakdown:

Scheduled Hours	Externship	Clock Hours
1	3	135
2	6	270
3	9	405
4	12	540
5	15	675
6	18	810

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Follow a set of instructor-written guidelines for the supervised work experience program.
2. Apply skills needed to be a viable member of the workforce.
 - a. Prepare a description of skills to be developed in the supervised work experience program.
 - b. Practice skills needed to be a viable member of the workforce.
3. Practice human relationship skills in the supervised work experience program.
4. Practice positive work habits, responsibilities, and ethics.
5. Develop written occupational objectives in the supervised work experience program.
6. Assess performance of occupational skills.
 - a. Prepare daily written assessments of work performance as specified in the occupational objectives.
 - b. Present weekly written reports to the instructor of activities performed and objectives accomplished.

Course Number and Name: WLT 1931 Welding Seminar I

Classification: Technical Elective

Description: Instruction is designed to facilitate activities incorporated in the Skills USA (VICA) and professional organizations related to each student's career goal. This course will allow regular assembly of students to accomplish goals and objectives set by the Skills USA club, related organizations, and committees of these organizations. Leadership skills, understanding and participation in group projects, rapport with peers, community service and educational enrichment are encouraged.

Hour Breakdown:

Scheduled Hours	Lab	Clock Hours
1	2	60

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Develop a written plan that details the activities and projects to be completed.
 - a. Use a written plan that details the activities and projects to be completed.
 - b. Perform written occupational objectives in the special problem.
2. Assess accomplishment of objectives.
 - a. Prepare daily written assessments of accomplishment of objectives.
 - b. Present weekly written reports to the instructor of activities performed and objectives accomplished.
3. Use and follow a set of written guidelines for the special problem.
 - b. Develop and follow a set of written guidelines for the special problem.

Course Number and Name: WLT 1941 Welding Seminar II

Classification: Technical Elective

Description: Instruction is designed to facilitate activities incorporated in the Skills USA (VICA) and professional organizations related to each student's career goal. This course will allow regular assembly of students to accomplish goals and objectives set by the Skills USA club, related organizations, and committees of these organizations. Leadership skills, understanding and participation in group projects, rapport with peers, community service and educational enrichment are encouraged.

Hour Breakdown:

Scheduled Hours	Lab	Clock Hours
1	2	60

National Assessment: None

Prerequisite: Instructor Approved

Student Learning Outcomes:

1. Develop a written plan that details the activities and projects to be completed.
 - a. Use a written plan that details the activities and projects to be completed.
 - b. Perform written occupational objectives in the special problem.
2. Assess accomplishment of objectives.
 - a. Prepare daily written assessments of accomplishment of objectives.
 - b. Present weekly written reports to the instructor of activities performed and objectives accomplished.
3. Use and follow a set of written guidelines for the special problem.
 - a. Develop and follow a set of written guidelines for the special problem.

Course Number and Name: DDT 1114 Fundamentals of Drafting

Classification: Technical Elective

Description: The course is designed to teach the fundamentals and principles of drafting to provide the basic background needed for all other drafting courses.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	150

National Assessment:

Prerequisite: None

Student Learning Outcomes:

1. Discuss classroom procedures and drafting occupations.
 - a. Describe proper classroom/lab procedures.
2. Describe the various occupations in drafting and their requirements. Explain and apply safety rules and regulations.
 - a. Describe safety rules for drafting occupations.
 - b. List and discuss hazardous materials found in the drafting area.
3. Apply proper techniques in technical drawings.
 - a. Demonstrate the ability to scale drawings.
 - b. Construct various angles.
 - c. Recognize and construct the alphabet of lines.
4. Sketch and develop views of basic shapes.
 - a. Develop a pictorial view from three principal views.
 - b. Develop three principal views from a pictorial view.
 - c. Complete three principal views when lines are missing.
5. Use geometric constructions.
 - a. Construct tangent arcs and lines.
 - b. Divide lines or arcs into equal and/or proportional parts.
 - c. Develop geometric shapes.
6. Construct orthographic projections.
 - a. Construct a top view, with front and right side views given.
 - b. Construct a front view, with top and right side views given.
 - c. Construct a right side view, with top and front views given.
 - d. Develop a drawing consisting of three principal views.
7. Dimension objects.
 - a. Recognize lines, symbols, features, and conventions used in dimensioning.
 - b. Recognize and use size and location dimensions.
 - c. Recognize and use general and local notes.
 - d. Dimension a drawing using contour, chain, and baseline dimensioning.

8. Construct sectional views.
 - a. Construct full and half sectional views.
 - b. Recognize and construct removed, revolved, offset, and aligned sectional views.

RECOMMENDED TOOLS AND EQUIPMENT

Capitalized Items

Access to some tools and equipment may be provided by Machine Shop, Electrical, Plumbing/Pipefitting, Automotive, and Welding Program facilities.

1. Oxyfuel burning table with dross pan and replaceable slats (4 ft x 8 ft x 31 in.) (1)
2. OSHA approved exhaust system (1)
3. Guided bend test jig or machine (hydraulic) (1)
4. Plasma arc cutting device with min. 1/2 in. cutting depth with accessories (2)
5. Combination (multi-process) machine with power source (6 or 8 pack) with cables and accessories for 4 GTAW and 4 GMAW setup with accessories (13)
6. Shielded metal arc welding machines (AC/DC - constant current 250-300 amp @ 60%) with cables and with accessories (13)
7. Oxyfuel gas cutting equipment with regulators, hoses, torch, tips, cart, and accessories (5 sets)
8. Machine oxyfuel gas cutting equipment with regulators, hoses, torch, tips, rails or track, and accessories (1 set)
9. Leather jacket, cape, sleeves or apron, and leather gloves (1 set per student)
10. Ironworker with accessories (70 ton) (1)
11. Large drill press with accessories (1)
12. Small drill press with accessories (1)
13. Band saw (vertical or horizontal) (1)
14. Portable abrasive cutoff saw (min. 16 in.) (1)
15. Heavy-duty four-wheel material mover (1)
16. Crane (A-frame) heavy duty, with 5 T electric hoist (1)
17. Pipe bevel machine for mild steel (oxyfuel) (1)
18. Welder, engine driven (200 A, constant current/constant voltage @ 60% duty cycle) (1)
19. Electrode shop oven (1)
20. AWS Welding Educator's Library, Miami, FL: American Welding Society, 1995
21. Microcomputer with CD-ROM, SVGA graphics card, and modem and operating software (20)
22. Fork lift (1)

Non-Capitalized Items

1. First aid kit (2)
2. Emergency eye wash station (1)
3. Workbench with medium duty vise (4)
4. 8-in. C-clamps (1 per student)
5. 4 1/2-in. right angle grinder (5)
6. 9-in. right angle grinder (5)
7. Work area protective screens (as required) (1 for each welding booth)
8. Framing squares (24 in. x 18 in.) (6)
9. Compressed air hose (50 ft) with retractable reel (2)
10. Compressed air regulator (1)
11. Male and female quick couples and adaptors (2)
12. Hose repair kit with crimping tool for oxyfuel cutting equipment (2)
13. Safety glasses with side shields (1 per student)
14. Burning goggles (1 per student)
15. Face shield (10 per program)
16. #5 Filter plate/lens for burning goggles (1 per student)
17. Clear cover plate/lens for burning goggles (2 per student)
18. Welding helmet #10 shaded filter plate/lens, with head gear and accessories (20)

19. Welding lenses to match helmet, #11 shaded filter plate/lens (6 sets)
20. Clear cover plate/lens for welding helmets (2 per student)
21. Stainless steel wire brush (20)
22. 16-oz ball-peen hammer (4)
23. 4-lb shop hammer (4)
24. Electric hand drill (1/2 inch chuck) (2)
25. Retractable extension cords (4)
26. Center punches (1 set)
27. Metal scribe (6)
28. Steel dividers (radius maker, min. 6 in.) (2)
29. Steel tape measure (minimum 10 ft) (20)
30. Combination square set (4)
31. Chipping hammer (20)
32. 10 inch mill file (half round-bastard cut) (20)
33. Cold chisels (1 set)
34. Adjustable wrenches (12 in., 10 in., 8 in., 6 in.) (1 set)
35. Tank wrench (2)
36. 10-in. groove or slip joint pliers (8)
37. 6-in. combination side cutting/needle nose pliers (10)
38. 10-in. vise grips (4)
39. 10-in. vise grip clamp or tongs (20)
40. Allen or hex wrenches, standard and metric (1/16 - 3/8) (2 sets)
41. Screwdrivers, flat head (1 set)
42. Screwdrivers, Phillips head (1 set)
43. Oxyfuel friction lighter, with flints and tip cleaners (12)
44. Fillet gages (2 sets)
45. Pedestal grinder (2)
46. Jack stands (2 sets)
47. Carbon arc gouging whip (5)
48. Steel wire brush (20)
49. AWS Safety in Welding and Cutting (ANSI/ASC Z49.1-88). Miami, FL: American Welding Society, 1988 (1)

Recommended Instructional Aids

It is recommended that instructors have access to the following items:

1. Screen, projection (1 per program)
2. Overhead projector (1) and Cutting Technology
3. Video out (Microcomputer to TV monitor) (1)
4. Interactive presentation board with accessories (1)

INTEGRATED PATHWAY COURSE NUMBER CROSSWALK

The Mississippi Integrated Pathway Model is designed to allow students to complete coursework in smaller semester credit hour courses. Content from each module can be found in the courses listed in the first column of the following table.

Traditional Course Number	Integrated Pathway Course Number	Aligned Industry Certification
WLT 1173 Introduction to Welding Safety	WLT 1111 Welding Safety, Math, and Hand Tools	NCCER Core Curriculum <ul style="list-style-type: none"> Module 00101-09— Basic Safety Module 00102-09—Introduction to Construction Math Module 00103-09—Introduction to Hand Tools NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29101-09—Welding Safety
	WLT 1121 Welding Power Tools, Drawings, and Rigging	NCCER Core Curriculum <ul style="list-style-type: none"> Module 00104-09—Introduction to Power Tools Module 00105-09—Introduction to Construction Drawing Module 00106-09—Basic Rigging
	WLT 1131 Communication Skills, Employability Skills, and Materials Handling	NCCER Core Curriculum <ul style="list-style-type: none"> Module 00107-09—Basic Communication Skills Module 00108-09—Basic Employability Skills Module 00109-09—Introduction to Materials Handling
WLT 1115 Shielded Metal Arc Welding I	WLT 1141 SMAW Basic Metal Preparation	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29105-09—Base Metal Preparation
	WLT 1151 SMAW Equipment and Setup	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29107-09—SMAW-Equipment and Setup
	WLT 1171 SMAW Electrodes	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29108-09—Shielded Metal Arc Welding-Electrodes
	WLT 1181 SMAW Beads and Fillet Welds	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29109-09—SMAW-Beads and Fillet Welds
	WLT 1191 SMAW Weld Quality	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29106-09—Weld Quality

WLT 1225 Shielded Metal Arc Welding II	WLT 1211 SWAM Joint Fit-Up and Alignment	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29110-09—Joint Fit-Up and Alignment
	WLT 1221 SWAM Groove Welds and Backing	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29111-09—SMAW- Groove Welds with Backing
	WLT 1241 SWAM Open V-Groove Welds	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29112-09—Open V-Groove Welds
	WLT 1261 SMAW II Weld Quality I	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29106-09—Weld Quality
	WLT 1271 SMAW II Weld Quality II	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29106-09—Weld Quality
WLT 1313 Cutting Processes	WLT 1311 Oxyfuel Cutting	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29102-09—Oxyfuel Cutting Module 29106-09—Weld Quality
	WLT 1321 Plasma Arc Cutting	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29103-09—Plasma Arc Cutting Module 29106-09—Weld Quality
	WLT 1331 Air Carbon Arc Cutting and Gouging	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29104-09—Air Carbon Arc Cutting and Gouging (GMAW Only) Module 29106-09—Weld Quality
WLT Gas Metal Arc Welding (GMAW)	WLT 1342 GMAW Equipment and Filler Metals	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29205-09—GMAW and FCAW: Equipment and Filler Metals (GMAW Only) Module 29106-09—Weld Quality
	WLT 1352 GMAW Plate	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29206-09—GMAW and FCAW: Plate (GMAW Only) Module 29106-09—Weld Quality
WLT 1143 Flux Cored Arc Welding (FCAW)	WLT 1361 FCAW Equipment and Filler Metals	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29205-09—GMAW and FCAW: Equipment and Filler Metals (FCAW Only)
	WLT 1371 FCAW Plate	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29206-09—GMAW and FCAW: Plate (FCAW Only)
	WLT 1381 FCAW Weld Quality	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29106-09—Weld Quality (FCAW Only)
WLT 1135 Gas Tungsten Arc Welding (GTAW)	WLT1412 GTAW: Equipment and Filler Metals	NCCER Welding Level 2 <ul style="list-style-type: none"> Module 29207-09—GTAW: Equipment and Filler Metals
	WLT 1422 GTAW: Plate	NCCER Welding Level 2 <ul style="list-style-type: none"> Module 29208-09—GTAW: Plate

	WLT 1431 GTAW Weld Quality	NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29106-09—Weld Quality (GTAW)
WLT 1232 Blueprint Reading, Welding Symbols, and Metallurgy	WLT 1451 Welding Symbols and Drawings	NCCER Welding Level 2 <ul style="list-style-type: none"> Module 29201-09—Welding Symbols Module 29202-09—Reading Welding Detail Drawings
	WLT 1461 Metallurgy	NCCER Welding Level 2 <ul style="list-style-type: none"> Module 29203-09—Physical Characteristics and Mechanical Properties of Metal Module 29204-09—Pre-heating and Post-Heating of Metals NCCER Welding Level 1 <ul style="list-style-type: none"> Module 29106-09—Weld Quality (GTAW)

STUDENT COMPETENCY PROFILE

Student competency profiles are not required, but can assist instructors in documenting student performance.

Student Name: _____

Date Student Mastered Material	Course Number and Name	NCCER Credential and Module
	WLT 1173 Introduction to Welding Safety	NCCER Core Curriculum Module 00101-09—Basic Safety Module 00102-09—Introduction to Construction Math Module 00103-09—Introduction to Hand Tools Module 00104-09—Introduction to Power Tools Module 00105-09—Introduction to Construction Drawing Module 00106-09—Basic Rigging Module 00107-09—Basic Communication Skills Module 00108-09—Basic Employability Skills Module 00109-09—Introduction to Materials Handling NCCER Welding Level 1 Module 29101-09—Welding Safety OR AWS Sense Level 1 Module 1: Occupational Orientation Module 2: Safety and Health of Welders

	<p>WLT 1115 Shielded Metal Arc Welding I</p>	<p>NCCER Welding Level 1 Module 29105-09—Base Metal Preparation Module 29107-09—SMAW-Equipment and Setup Module 29108-09—Shielded Metal Arc Welding- Electrodes Module 29109-09—SMAW-Beads and Fillet Welds Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 4: Shielded Metal Arc Welding (SMAW) Module 9: Welding Inspection And Testing Key Indicators</p>
	<p>WLT 1225 Shielded Metal Arc Welding II</p>	<p>NCCER Welding Level 1 Module 29110-09—Joint Fit-Up and Alignment Module 29111-09—SMAW- Groove Welds with Backing Module 29112-09—Open V-Groove Welds Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 4: Shielded Metal Arc Welding (SMAW) <i>(Continued from WLT 1115)</i> MODULE 9: WELDING INSPECTION AND TESTING KEY INDICATORS</p>
	<p>WLT 1314 Cutting Processes</p>	<p>NCCER Welding Level 1 Module 29102-09—Oxyfuel Cutting Module 29103-09—Plasma Arc Cutting Module 29104-09—Air Carbon Arc Cutting and Gouging Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 8: Thermal Cutting Processes Module 9: Welding Inspection and Testing Key Indicators</p>
	<p>WLT 1124 Gas Metal Arc Welding (GMAW)</p>	<p>NCCER Welding Level 2 <i>(Only GMAW components)</i> Module 29205-09—GMAW and FCAW: Equipment and Filler Metals Module 29206-09—GMAW and FCAW: Plate</p> <p>NCCER Welding Level 1 Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 5: Gas Metal Arc Welding (GMAW-S, GMAW Spray Transfer) Module 9: Welding Inspection And Testing Key Indicators</p>

	<p>WLT 1143 Flux Cored Arc Welding (FCAW)</p>	<p>NCCER Welding Level 2 Module 29205-09—GMAW and FCAW: Equipment and Filler Metals Module 29206-09—GMAW and FCAW: Plate NCCER Welding Level 1 Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 6: Flux Cored Arc Welding (FCAW-G/GM, FCAW-S) Module 9: Welding Inspection And Testing Key Indicators</p>
	<p>WLT 1135 Gas Tungsten Arc Welding (GTAW)</p>	<p>NCCER Welding Level 2 Module 29207-09—GTAW: Equipment and Filler Metals Module 29208-09—GTAW: Plate NCCER Welding Level 1 Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 7: Gas Tungsten Arc Welding (GTAW) Module 9: Welding Inspection and Testing Key Indicators</p>
	<p>WLT 1232 Blueprint Reading, Welding Symbols, and Metallurgy</p>	<p>NCCER Welding Level 2 Module 29201-09—Welding Symbols Module 29202-09—Reading Welding Detail Drawings Module 29203-09—Physical Characteristics and Mechanical Properties of Metal Module 29204-09—Pre-heating and Post-Heating of Metals NCCER Welding Level 1 Module 29106-09—Weld Quality</p> <p style="text-align: center;">OR</p> <p>AWS Sense Level 1 Module 3: Drawing and Welding Symbol Interpretation Module 9: Welding Inspection and Testing Key Indicators</p>

CURRICULUM DEFINITIONS AND TERMS

- Course Name – A common name that will be used by all community colleges in reporting students
- Course Abbreviation – A common abbreviation that will be used by all community and junior colleges in reporting students
- Classification – Courses may be classified as the following:
 - Career Certificate Required Course – A required course for all students completing a career certificate.
 - Technical Certificate Required Course – A required course for all students completing a technical certificate.
 - Technical Elective – Elective courses that are available for colleges to offer to students.
- Description – A short narrative that includes the major purpose(s) of the course
- Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course
- Corequisites – A listing of courses that may be taken while enrolled in the course
- Student Learning Outcomes – A listing of the student outcomes (major concepts and performances) that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
 - Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
 - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
 - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
 - Activities that include integration of academic and career–technical skills and course work, school-to-work transition activities, and articulation of secondary and postsecondary career–technical programs
 - Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas
- Sequencing of the course within a program is left to the discretion of the local college. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors. Programs that offer an Associate of Applied Science Degree must include all of the required Career Certificate courses, Technical Certificate courses **AND** a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.
- In order to provide flexibility within the districts, individual courses within a framework may be customized by doing the following:

- Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework
- Revising or extending the student learning outcomes
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)