

WELDING TECHNOLOGY CURRICULUM FRAMEWORK



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VISION

All Nevadans ready for success in the 21st century

MISSION

To improve student achievement and educator effectiveness by ensuring opportunities, facilitating learning, and promoting excellence



INTRODUCTION

The Nevada Career and Technical Education (CTE) Curriculum Frameworks are a resource for Nevada's public schools and charter schools to design, implement, and assess their CTE programs and curriculum. The content standards identified in this document are listed as a model for the development of local district programs and curriculum. They represent rigorous and relevant expectations for student performance, knowledge, and skill attainment which have been validated by industry representatives.

This curriculum framework ensures the following:

- CTE course(s) and course sequence teaches the knowledge and skills required by industry through applied learning methodology and, where appropriate, work-based learning experiences that prepare students for careers in high-wage, high-skill, and/or in-demand fields. Regional and state economic development priorities shall play an important role in determining program approval. Some courses also provide instruction focused on personal development.
- CTE course(s) and course sequence includes leadership and employability skills as an integral part of the curriculum.
- CTE course(s) and course sequence is part of a rigorous program of study and includes sufficient technical challenge to meet state and/or industry-standards.

**NEVADA DEPARTMENT OF EDUCATION
CURRICULUM FRAMEWORK FOR
WELDING TECHNOLOGY**

PROGRAM INFORMATION

Program Title: Welding Technology
State Skill Standards: Welding Technology
Standards Reference Code: WELD
Career Cluster: Manufacturing
Career Pathway: Production
Program Length: 2-year, completed sequentially
Program Assessments: TBD
Workplace Readiness Skills
CTSO: SkillsUSA
Grade Level: 9-12
Industry Certifications: See Nevada’s Approved Certification Listing

PROGRAM PURPOSE

The purpose of this program is to prepare students for postsecondary education and employment in the Welding Technology industry.

The program includes the following state standards:

- Nevada CTE Skill Standards: Welding Technology
- Employability Skills for Career Readiness
- Nevada Academic Content Standards (alignment shown in the Nevada CTE Skill Standards):
 - English Language Arts
 - Mathematics
 - Science
- Common Career Technical Core (alignment shown in the Nevada CTE Skill Standards)

CAREER CLUSTERS

The National Career Clusters® Framework provides a vital structure for organizing and delivering quality CTE programs through learning and comprehensive programs of study (POS). In total, there are 16 Career Clusters in the National Career Clusters Framework, representing more than 79 Career Pathways to help students navigate their way to greater success in college and career. As an organizing tool for curriculum design and instruction, Career Clusters provide the essential knowledge and skills for the 16 Career Clusters and their Career Pathways.*

*Cite: National Association of State Directors of Career Technical Education Consortium. (2012). Retrieved from <https://cte.careertech.org/sites/default/files/CareerClustersPathways.pdf> and <https://www.air.org/sites/default/files/CTEClusters.pdf>

PROGRAM OF STUDY

The program of study illustrates the sequence of academic and career and technical education coursework that is necessary for the student to successfully transition into postsecondary educational opportunities and employment in their chosen career path. (NAC 389.803)

PROGRAM STRUCTURE

The core course sequencing with the complementary courses provided in the following table serves as a guide to schools for their programs of study. Each course is listed in the order in which it should be taught. Complete program sequences are essential for the successful delivery of all state standards in each program area. A program does not have to utilize the complementary courses for students to complete their program of study.

WELDING TECHNOLOGY**Required Core Course Sequence (R) with Complementary Courses (C)**

Required/ Complementary	Course Title	Abbreviated Name	CIP Code	SCED Subject Area	SCED Course Identifier	SCED Course Level	SCED Unit Credit	SCED Course Sequence	SCED Course Number
R	Welding Technology I	WELDING TECH I	48.0508	13	207	G	1.00	12	13207G1.0012
R	Welding Technology II	WELDING TECH II	48.0508	13	207	G	1.00	22	13207G1.0022
C	Welding Technology II LAB	WELDING TECH II L	48.0508	13	207	E	1.00	22	13207E1.0022
C	Welding Technology Advanced Studies	WELDING TECH AS	48.0508	13	207	E	1.00	11	13207E1.0011
C	CTE Work Experience - Manufacturing	WORK EXPER MANUF	99.0013	13	098	G	1.00	11	13098G1.0011

STATE SKILL STANDARDS

The state skill standards are designed to clearly state what the student should know and be able to do upon completion of an advanced high school career and technical education (CTE) program. The standards are designed for the student to complete all standards through their completion of a program of study. The standards are designed to prepare the student for the end-of-program technical assessment directly aligned to the standards. (Paragraph (a) of Subsection 1 of NAC 389.800)

EMPLOYABILITY SKILLS FOR CAREER READINESS STANDARDS

Employability skills, often referred to as “soft skills,” have for many years been a recognizable component of the standards and curriculum in career and technical education programs. The twenty-one standards are organized into three areas: (1) Personal Qualities and People Skills; (2) Professional Knowledge and Skills; and (3) Technology Knowledge and Skills. The standards are designed to ensure students graduate high school properly prepared with skills employers prioritize as the most important. Instruction on all twenty-one standards must be part of each course of the CTE program. (Paragraph (d) of Subsection 1 of NAC 389.800)

CURRICULUM FRAMEWORK

The Nevada CTE Curriculum Frameworks are organized utilizing the recommended course sequencing listed in the program of study and the CTE Course Catalog. The framework identifies the recommended content standards, performance standards, and performance indicators that should be taught in each course.

CAREER AND TECHNICAL STUDENT ORGANIZATIONS (CTSOs)

To further the development of leadership and technical skills, students must have opportunities to participate in one or more of the Career and Technical Student Organizations (CTSOs). CTSOs develop character, citizenship, and the technical, leadership and teamwork skills essential for the workforce and their further education. Their activities are considered a part of the instructional day when they are directly related to the competencies and objectives in the course. (Paragraph (a) of Subsection 3 of NAC 389.800)

WORKPLACE READINESS SKILLS ASSESSMENT

The Workplace Readiness Skills Assessment has been developed to align with the Nevada CTE Employability Skills for Career Readiness Standards. This assessment provides a measurement of student employability skills attainment. Students who complete a program will be assessed on their skill attainment during the completion level course. Completion level courses are identified in the Program Structure table as SCED Course Level “G” and SCED Course Sequence 22 or 33. (Paragraph (d) of Subsection 1 of NAC 389.800)

END-OF-PROGRAM TECHNICAL ASSESSMENT

An end-of-program technical assessment may be implemented for those programs with current industry validated standards to align with the Nevada CTE Skill Standards for this program. This assessment provides a measurement of student technical skill attainment. Students who complete a program will be assessed on their skill attainment during the completion level course. Completion level courses are identified in the Program Structure table as SCED Course Level “G” and SCED Course Sequence 22 or 33. (Paragraph (e) of Subsection 1 of NAC 389.800)

CERTIFICATE OF SKILL ATTAINMENT

Each student who completes a course of study must be awarded a certificate which states that they have attained specific skills in the industry being studied and meets the following criteria: A student must maintain a 3.0 grade point average in their approved course of study, pass the Workplace Readiness Skills Assessment, and pass the end-of-program technical assessment. (Subsection 4 of NAC 389.800)

CTE ENDORSEMENT ON A HIGH SCHOOL DIPLOMA

A student qualifies for a CTE endorsement on their high school diploma after successfully completing the following criteria: (1) completion of a CTE course of study in a program area; (2) completion of academic requirements governing receipt of a standard diploma; and (3) meet all requirements for the issuance of the Certificate of Skill Attainment. (NAC 389.815)

CTE COLLEGE CREDIT

CTE College Credit is awarded to students based on articulation agreements established by each college for the CTE program, where the colleges will determine the credit value of a full high school CTE program based on course alignment. An articulation agreement will be established for each CTE program designating the number of articulated credits each college will award to students who complete the program.

CTE College Credit is awarded to students who: (1) complete the CTE course sequence with a grade-point average of 3.0 or higher; (2) pass the state end-of-program technical assessment for the program; and (3) pass the Workplace Readiness Assessment for employability skills.

Pre-existing articulation agreements will be recognized until new agreements are established according to current state policy and the criteria shown above.

Please refer to the local high school's course catalog or contact the local high school counselor for more information. (Paragraph (b) of Subsection 3 of NAC 389.800)

ACADEMIC CREDIT FOR CTE COURSEWORK

Career and technical education courses meet the credit requirements for high school graduation (1 unit of arts and humanities or career and technical education). Some career and technical education courses meet academic credit for high school graduation. Please refer to the local high school's course catalog or contact the local high school counselor for more information. (NAC 389.672)

CORE COURSES**RECOMMENDED STUDENT PERFORMANCE STANDARDS****COURSE INFORMATION**

Course Title: Welding Technology I
Abbreviated Name: WELDING TECH I
Credits: 1
Prerequisite: None
CTSO: SkillsUSA

COURSE DESCRIPTION

This course will introduce the student to the concepts and practices in welding while allowing the more ambitious student to gain occupational training experience necessary to participate in various Welding Certifications. This course is intended to provide students with the basic knowledge, skills, and theory in the characteristics of metals, their structure and properties, and welding technologies. Students will gain an understanding of welding equipment, hand and power tools, safety procedures, print reading, measuring, and scaling techniques, machine operation, industrial applications including Shielded Metal Arc Welding (SMAW) and Thermal Cutting processes, and provide them with entry-level skills for employment.

TECHNICAL STANDARDS**CONTENT STANDARD 1.0: INTEGRATE CAREER AND TECHNICAL STUDENT ORGANIZATIONS (CTSOS)**

Performance Standard 1.1: Explore the History and Organization of CTSOs

Performance Indicators: 1.1.1-1.1.3

Performance Standard 1.2: Develop Leadership Skills

Performance Indicators: 1.2.1-1.2.6

Performance Standard 1.3: Participate in Community Service

Performance Indicators: 1.3.1-1.3.3

Performance Standard 1.4: Develop Professional and Career Skills

Performance Indicators: 1.4.1-1.4.5

Performance Standard 1.5: Understand the Relevance of Career and Technical Education (CTE)

Performance Indicators: 1.5.1-1.5.3

CONTENT STANDARD 2.0: IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES

Performance Standard 2.1: Demonstrate General Lab Safety Rules and Procedures

Performance Indicators: 2.1.1-2.1.18

Performance Standard 2.2: Identify and Utilize Hand Tools

Performance Indicators: 2.2.1-2.2.5

Performance Standard 2.3: Identify and Utilize Power Tools and Equipment

Performance Indicators: 2.3.1-2.3.5

CONTENT STANDARD 3.0: APPLY FUNDAMENTAL PRINT READING, MEASUREMENT, AND LAYOUT/FIT-UP TECHNIQUES

Performance Standard 3.1: Demonstrate Print Reading and Sketching Practices

Performance Indicators: 3.1.1-3.1.4

Performance Standard 3.2: Demonstrate Measuring and Scaling Techniques

Performance Indicators: 3.2.1-3.2.6

Performance Standard 3.3: Utilize Layout Principles and Practices

Performance Indicators: 3.3.1-3.3.4

Performance Standard 3.4: Demonstrate Preparation and Fit-up Practices

Performance Indicators: 3.4.1

CONTENT STANDARD 4.0: IDENTIFY PROPERTIES OF METALS

Performance Standard 4.1: Identify Material Properties

Performance Indicators: 4.1.1-4.1.2

Performance Standard 4.2: Identify Filler Metals

Performance Indicators: 4.2.1-4.2.3

CONTENT STANDARD 5.0: APPLY SHIELDED METAL ARC WELDING (SMAW) TECHNIQUES

Performance Standard 5.1: Safety Procedures

Performance Indicators: 5.1.1-5.1.3

Performance Standard 5.2: Produce Welds Using SMAW on Carbon Steel

Performance Indicators: 5.2.1-5.2.4

CONTENT STANDARD 6.0: APPLY THERMAL CUTTING PROCESSES

Performance Standard 6.1: Demonstrate Oxy-Fuel Gas Cutting (OFC)

Performance Indicators: 6.1.1-6.1.9

CONTENT STANDARD 7.0: APPLY FABRICATION FUNDAMENTALS

Performance Standard 7.1: Utilize Base Metal Preparation Fundamentals

Performance Indicators: 7.1.1-7.1.2

EMPLOYABILITY SKILLS FOR CAREER READINESS STANDARDS

CONTENT STANDARD 1.0: DEMONSTRATE EMPLOYABILITY SKILLS FOR CAREER READINESS

Performance Standard 1.1: Demonstrate Personal Qualities and People Skills

Performance Indicators: 1.1.1-1.1.7

Performance Standard 1.2: Demonstrate Professional Knowledge and Skills

Performance Indicators: 1.2.1-1.2.10

Performance Standard 1.3: Demonstrate Technology Knowledge and Skills

Performance Indicators: 1.3.1-1.3.4

ALIGNMENT TO THE NEVADA ACADEMIC CONTENT STANDARDS*

English Language Arts: Reading Standards for Literacy in Science and Technical Subjects
Writing Standards for Literacy in Science and Technical Subjects
Speaking and Listening

Mathematics: Mathematical Practices
Geometry
Numbers and Quantity

Science: Physical Science

*Refer to the Welding Technology Standards for alignment by performance indicator.

COURSE INFORMATION

Course Title: Welding Technology II
Abbreviated Name: WELDING TECH II
Credits: 1
Prerequisite: Welding Technology I
Program Assessments: TBD
Workplace Readiness Skills
CTSO: SkillsUSA

COURSE DESCRIPTION

This course is a continuation of Welding Technology I. This course provides intermediate welding students the ability to augment and further their skill and knowledge levels. Areas of study will include advanced layout and fabrication methodologies, continuation of shielded metal arc welding (SMAW) and thermal cutting processes, fabrication techniques and Gas Metal Arc Welding (GMAW) welding and GMAW Spray transfer on Carbon Steel, Flux Cored Arc Welding (FCAW) and FCAW spray transfer on carbon steel, and Gas Tungsten Arc Welding (GTAW) on carbon steel. All student activities are designed to enhance students' skill levels toward achievement of various welding certifications. The appropriate use of technology and industry-standard equipment is an integral part of this course.

TECHNICAL STANDARDS**CONTENT STANDARD 1.0: INTEGRATE CAREER AND TECHNICAL STUDENT ORGANIZATIONS (CTSOS)**

Performance Standard 1.1: Explore the History and Organization of CTSOs

Performance Indicators: 1.1.1-1.1.3

Performance Standard 1.2: Develop Leadership Skills

Performance Indicators: 1.2.1-1.2.6

Performance Standard 1.3: Participate in Community Service

Performance Indicators: 1.3.1-1.3.3

Performance Standard 1.4: Develop Professional and Career Skills

Performance Indicators: 1.4.1-1.4.5

Performance Standard 1.5: Understand the Relevance of Career and Technical Education (CTE)

Performance Indicators: 1.5.1-1.5.3

CONTENT STANDARD 3.0: APPLY FUNDAMENTAL PRINT READING, MEASUREMENT, AND LAYOUT/FIT-UP TECHNIQUES

Performance Standard 3.1: Demonstrate Print Reading and Sketching Practices

Performance Indicators: 3.1.5-3.1.6

Performance Standard 3.4: Demonstrate Preparation and Fit-up Practices

Performance Indicators: 3.4.2-3.4.3

CONTENT STANDARD 4.0: IDENTIFY PROPERTIES OF METALS

Performance Standard 4.1: Identify Material Properties

Performance Indicators: 4.1.3-4.1.4

CONTENT STANDARD 5.0: APPLY SHIELDED METAL ARC WELDING (SMAW) TECHNIQUES

Performance Standard 5.2: Produce Welds Using SMAW on Carbon Steel

Performance Indicators: 5.2.5-5.2.8

CONTENT STANDARD 6.0: APPLY THERMAL CUTTING PROCESSES

Performance Standard 6.2: Demonstrate Plasma Arc Cutting (PAC) on Carbon Steel and/or Aluminum

Performance Indicators: 6.2.1-6.2.8

CONTENT STANDARD 7.0: APPLY FABRICATION FUNDAMENTALS

Performance Standard 7.1: Utilize Base Metal Preparation Fundamentals

Performance Indicators: 7.1.3-7.1.4

Performance Standard 7.2: Demonstrate Part Preparation with Cutting and Forming Techniques

Performance Indicators: 7.2.1-7.2.3

Performance Standard 7.3: Demonstrate Fabrication Techniques

Performance Indicators: 7.3.1-7.3.5

CONTENT STANDARD 8.0: APPLY GAS METAL ARC WELDING (GMAW-S, GMAW) TECHNIQUES

Performance Standard 8.1: Utilize Safety Procedures

Performance Indicators: 8.1.1-8.1.4

Performance Standard 8.2: Produce Welds Using GMAW-S on Carbon Steel

Performance Indicators: 8.2.1-8.2.6

Performance Standard 8.3: Produce Welds Using GMAW (Spray Transfer) on Carbon Steel

Performance Indicators: 8.3.1-8.3.5

CONTENT STANDARD 9.0: APPLY FLUX CORED ARC WELDING (FCAW-G, FCAW-S) TECHNIQUES

Performance Standard 9.1: Utilize Safety Procedures

Performance Indicators: 9.1.1-9.1.4

Performance Standard 9.2: Produce Welds Using FCAW-G on Carbon Steel

Performance Indicators: 9.2.1-9.2.6

Performance Standard 9.3: Produce Welds Using FCAW-S on Carbon Steel

Performance Indicators: 9.3.1-9.3.6

CONTENT STANDARD 10.0: APPLY GAS TUNGSTEN ARC WELDING (GTAW) TECHNIQUES

Performance Standard 10.1: Utilize Safety Procedures

Performance Indicators: 10.1.1-10.1.3

Performance Standard 10.2: Produce Welds Using GTAW on Carbon Steel

Performance Indicators: 10.2.1-10.2.5

Performance Standard 10.3: Produce Welds Using GTAW on Aluminum

Performance Indicators: 10.3.1-10.3.2

EMPLOYABILITY SKILLS FOR CAREER READINESS STANDARDS**CONTENT STANDARD 1.0: DEMONSTRATE EMPLOYABILITY SKILLS FOR CAREER READINESS**

Performance Standard 1.1: Demonstrate Personal Qualities and People Skills

Performance Indicators: 1.1.1-1.1.7

Performance Standard 1.2: Demonstrate Professional Knowledge and Skills

Performance Indicators: 1.2.1-1.2.10

Performance Standard 1.3: Demonstrate Technology Knowledge and Skills

Performance Indicators: 1.3.1-1.3.4

ALIGNMENT TO THE NEVADA ACADEMIC CONTENT STANDARDS*

English Language Arts: Reading Standards for Literacy in Science and Technical Subjects
Writing Standards for Literacy in Science and Technical Subjects
Speaking and Listening

Mathematics: Mathematical Practices
Geometry
Numbers and Quantity

Science: Physical Science

*Refer to the Welding Technology Standards for alignment by performance indicator.

COMPLEMENTARY COURSES**RECOMMENDED STUDENT PERFORMANCE STANDARDS**

Programs that utilize the complementary courses can include the following:

- Continuation course(s)
- Advanced Studies course
- Lab course(s)
- CTE Work Experience courses

COURSE INFORMATION

Course Title: Welding Technologies Advanced Studies

Abbreviated Name: WELDING TECH AS

Credits: 1

Prerequisite: Welding Technology II

CTSO: SkillsUSA

COURSE DESCRIPTION

This course is offered to students who have achieved all content standards in a program and desire to pursue advanced study through investigation and in-depth research. Students are expected to work independently or in a team and consult with their supervising teacher for guidance. The supervising teacher will give directions, monitor, and evaluate the students' topic of study. Coursework may include various work-based learning experiences such as internships and job shadowing, involvement in a school-based enterprise, completion of a capstone project, and/or portfolio development. This course may be repeated for additional instruction and credit.

TECHNICAL STANDARDS

Students have achieved all program content standards and will pursue advanced study through investigation and in-depth research.

EMPLOYABILITY SKILLS FOR CAREER READINESS STANDARDS

Students have achieved all program content standards and will pursue advanced study through investigation and in-depth research.

SAMPLE TOPICS:

- Participate in individual/team competitions
- Complete a capstone project
- Participating in an internship or job shadow opportunities
- Explore college and career opportunities
- Explore advanced welding techniques and work towards certifications

COURSE INFORMATION**Course Title: Course Name II LAB****Abbreviated Name: WELDING TECH II L****Credits: 1****Prerequisite: Concurrent enrollment in Welding Technology II****CTSO: SkillsUSA****COURSE DESCRIPTION**

This course is designed to expand the students' opportunities for applied learning. This course provides an in-depth lab experience that applies the processes, concepts, and principles as described in the classroom instruction. The coursework will encourage students to explore and develop advanced skills in their program area. The appropriate use of technology and industry-standard equipment is an integral part of this course.

COURSE INFORMATION**Course Title: CTE Work Experience – Manufacturing****Abbreviated Name: WORK EXPER MANUF****Credits: 1****Prerequisite: Level 1 course and concurrently enrolled in the Level 2 or higher course****CTSO: SkillsUSA****COURSE DESCRIPTION**

This course is designed to expand the students' opportunities for applied learning. This course provides an in-depth CTE work experience that applies the processes, concepts, and principles as described in the classroom instruction. This course will encourage students to explore and develop advanced skills through work-based learning directly related to the program of study. The course must follow NAC 389.562, 389.564, 389.566 regulations.