

***Advanced Manufacturing
Technologies
Curriculum Framework***



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Vision

All Nevada students are equipped and feel empowered to attain their vision of success

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
Advanced Manufacturing Technologies**

Program Information

Program Title:	Advanced Manufacturing Technologies
State Skill Standards:	Advanced Manufacturing Technologies
Standards Reference Code:	ADVMFG
Career Cluster:	Manufacturing
Career Pathway:	Manufacturing Production Process Development / 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 Advanced Manufacturing Technologies industry.

The program includes the following state standards:

- Nevada CTE Skill Standards: Advanced Manufacturing Technologies
- 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. ^{1 and 2}

¹ Career Clusters | Advance CTE. (2022). Retrieved 31 August 2022, from <https://careertech.org/Career-Clusters>

² The National Career Clusters® Framework. (2022). American Institutes for Research. Retrieved 31 August 2022, from <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.

Advanced Manufacturing Technologies

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	Advanced Manufacturing Technologies I	AMT I	15.0613	13	104	G	1.00	12	13104G1.0012
R	Advanced Manufacturing Technologies II	AMT II	15.0613	13	104	G	1.00	22	13104G1.0022
C	Advanced Manufacturing Technologies II LAB	AMT II L	15.0613	13	104	E	1.00	22	13104E1.0022
C	Advanced Manufacturing Technologies Advanced Studies	AMT AS	15.0613	13	104	E	1.00	11	13104E1.0011
C	CTE Work Experience - Manufacturing	WORK EXPER MANUF	99.0013	13	098	G	1.00	11	13098G1.0011
C	Industry-Recognized Credential – Advanced Manufacturing Technologies	IRC AMT	15.0613	13	999	E	1.00	11	13999E1.0011

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 (NAC 389.800 [1]).

Employability Skills for Career Readiness Standards

Employability 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 (NAC 389.800 [1]).

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 (NAC 389.800 [3]).

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 (NAC 389.800 [1]).

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 (NAC 389.800 [1]).

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 (NAC 389.800 [4]).

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, if available, for the program of study, 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 (NAC 389.800 [3]).

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: Advanced Manufacturing Technologies I
Abbreviated Name: AMT I
Credits: 1
Prerequisite: None
CTSO: SkillsUSA

Course Description

The Advanced Manufacturing Technologies I course introduces the students to the fundamental advanced manufacturing skills such as measuring techniques, mathematic operations, 3D modeling, and the materials used in manufacturing. The fundamentals of power systems, control devices and various manufacturing processes will be investigated in this course. The use of robotics in Advanced Manufacturing will also be introduced.

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: 2.1.1-2.1.21

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 4.0: APPLY FUNDAMENTAL ADVANCED MANUFACTURING SKILLS

Performance Standard 4.1: Utilize Mathematical Operations and Measuring Techniques

Performance Indicators: 4.1.1-4.1.6

Performance Standard 4.2: Interpret Schematics and Technical Drawings

Performance Indicators: 4.2.1-4.2.3

Performance Standard 4.3: Demonstrate Spatial Reasoning and 3D Modeling Techniques

Performance Indicators: 4.3.1-4.3.5

Performance Standard 4.4: Investigate Materials Used in Advanced Manufacturing

Performance Indicators: 4.4.1-4.4.2

CONTENT STANDARD 5.0: APPLY FUNDAMENTAL POWER SYSTEM PRINCIPLES

Performance Standard 5.1: Identify and Utilize Basic Electrical Systems

Performance Indicators: 5.1.1-5.1.4

Performance Standard 5.2: Identify and Utilize Basic Mechanical Systems

Performance Indicators: 5.2.1

CONTENT STANDARD 6.0: CHARACTERIZE ADVANCED MANUFACTURING CONTROL DEVICES

Performance Standard 6.1: Investigate Motors in Advanced Manufacturing Systems

Performance Indicators: 6.1.1-6.1.2

Performance Standard 6.2: Apply Fundamentals of Electronics

Performance Indicators: 6.2.1-6.2.4

Performance Standard 6.3: Investigate Switches and Relays

Performance Indicators: 6.3.1

CONTENT STANDARD 7.0: IDENTIFY AND APPLY MANUFACTURING PROCESSES

Performance Standard 7.1: Apply Additive Manufacturing Processes

Performance Indicators: 7.1.1-7.1.4

Performance Standard 7.2: Demonstrate Subtractive Manufacturing Processes

Performance Indicators: 7.2.1-7.2.3

Performance Standard 7.3: Investigate Joining and Fastening Processes

Performance Indicators: 7.3.1-7.3.4

Performance Standard 7.4: Research Business Operations and Quality Control

Performance Indicators: 7.4.1

CONTENT STANDARD 8.0: INTRODUCTION TO ROBOTIC SYSTEMS

Performance Standard 8.1: Explore Robotic Systems in Advanced Manufacturing

Performance Indicators: 8.1.1-8.1.5

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

Mathematics: Mathematical Practices
Algebra
Geometry
Numbers and Quantity

Science: Science and Engineering Practices
Engineering Design

*Refer to the Advanced Manufacturing Technologies Standards for alignment by performance indicator.

Course Information

Course Title: Advanced Manufacturing Technologies II
Abbreviated Name: AMT II
Credits: 1
Prerequisite: Advanced Manufacturing Technologies I
Program Assessments: TBD
Workplace Readiness Skills
CTSO: SkillsUSA

Course Description

This course is a continuation of Advanced Manufacturing Technologies I. This course expands on the fundamental advanced manufacturing skills such as utilizing schematics and technical drawings, investigating the engineering design process, 3D modeling, and the materials used in manufacturing. Continuing the identification and use of power systems, control devices, sensors, actuators, and programmable logic controllers. Various manufacturing processes will be demonstrated in this course. The use of robotics in Advanced Manufacturing will also be continued.

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: 2.1.1-2.1.21

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: ANALYZE PROFESSIONAL PRACTICES

Performance Standard 3.1: Analyze Professional Ethical Practices Ethics in Advanced Manufacturing

Performance Indicators: 3.1.1-3.1.3

CONTENT STANDARD 4.0: APPLY FUNDAMENTAL ADVANCED MANUFACTURING SKILLS

Performance Standard 4.2: Interpret Schematics and Technical Drawings

Performance Indicators: 4.2.4

Performance Standard 4.4: Investigate Materials Used in Advanced Manufacturing

Performance Indicators: 4.4.3-4.4.5

Performance Standard 4.5: Investigate the Engineering Design Process

Performance Indicators: 4.5.1-4.5.5

Performance Standard 4.6: Identify Fundamental Advanced Manufacturing Components and Systems

Performance Indicators: 4.6.1-4.6.5

CONTENT STANDARD 5.0: APPLY FUNDAMENTAL POWER SYSTEM PRINCIPLES

Performance Standard 5.1: Identify and Utilize Basic Electrical Systems

Performance Indicators: 5.1.5-5.1.8

Performance Standard 5.2: Identify and Utilize Basic Mechanical Systems

Performance Indicators: 5.2.2-5.2.4

Performance Standard 5.3: Identify Power Systems

Performance Indicators: 5.3.1-5.3.8

Performance Standard 5.4: Identify and Utilize Basic Fluid Systems

Performance Indicators: 5.4.1-5.4.8

CONTENT STANDARD 6.0: CHARACTERIZE ADVANCED MANUFACTURING CONTROL DEVICES

Performance Standard 6.1: Investigate Motors in Advanced Manufacturing Systems

Performance Indicators: 6.1.3-6.1.5

Performance Standard 6.2: Apply Fundamentals of Electronics

Performance Indicators: 6.2.5-6.2.7

Performance Standard 6.3: Investigate Switches and Relays

Performance Indicators: 6.3.2-6.3.4

Performance Standard 6.4: Investigate Sensors and Actuators

Performance Indicators: 6.4.1-6.4.7

Performance Standard 6.5: Explore Programmable Logic Controllers

Performance Indicators: 6.5.1-6.5.4

CONTENT STANDARD 7.0: IDENTIFY AND APPLY MANUFACTURING PROCESSES

Performance Standard 7.2: Demonstrate Subtractive Manufacturing Processes

Performance Indicators: 7.2.4-7.2.10

Performance Standard 7.4: Research Business Operations and Quality Control

Performance Indicators: 7.4.2-7.4.4

CONTENT STANDARD 8.0: INTRODUCTION TO ROBOTIC SYSTEMS

Performance Standard 8.1: Explore Robotic Systems in Advanced Manufacturing

Performance Indicators: 8.1.2-8.1.4, 8.1.6-8.1.9

Performance Standard 8.2: Construct a Robotic System for Advanced Manufacturing

Performance Indicators: 8.2.1-8.2.3

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

Mathematics: Mathematical Practices
Algebra
Geometry
Numbers and Quantity

Science: Science and Engineering Practices
Engineering Design

*Refer to the Advanced Manufacturing Technologies Standards for alignment by performance indicator.

Complementary Courses

Programs that utilize the complementary courses can include the following:

- Advanced Studies course
- Lab course(s)
- CTE Work Experience courses
- Industry-Recognized Credential course

Course Information

Course Title: Advanced Manufacturing Technologies Advanced Studies

Abbreviated Name: AMT AS

Credits: 1

Prerequisite: Advanced Manufacturing Technologies II

CTSO: SkillsUSA

Course Description

This course is offered to students who have completed 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 completed all program content standards and will pursue advanced study through investigation and in-depth research.

Employability Skills for Career Readiness Standards

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

Sample Topics:

- Work towards earning Industry-Recognized Credentials
- Participate in an internship or job shadowing opportunities
- Complete a Capstone Project
- Participate in individual/team competitions

Course Information**Course Title:** Advanced Manufacturing Technologies II LAB**Abbreviated Name:** AMT II L**Credits:** 1**Prerequisite:** Concurrent enrollment in Advanced Manufacturing Technologies 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.

Course Information

Course Title: Industry-Recognized Credential – Advanced Manufacturing Technologies

Abbreviated Name: IRC AMT

Credits: 1

Prerequisite: Completion of Advanced Manufacturing Technologies Program of Study

CTSO: SkillsUSA

Course Description

This course is offered to students who have completed all content standards in a program of study and desire to pursue an Industry-Recognized Credential that aligns with the standards and skills associated with the Advanced Manufacturing Technologies Program of Study. This course is designed to expand the students' opportunities to pursue certification aligned with employment standards in the industry aligned with this program of study. The supervising teacher will provide instruction aligned with the certification requirements, monitor progress toward certification, and provide the students with appropriate testing or certification opportunities associated with the intended Industry-Recognized Credential that is the subject of the course. This course may be repeated for additional instruction and credit.