AUTOMATION TECHNOLOGY
CURRICULUM FRAMEWORK

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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 CTE Curriculum Frameworks are a resource for Nevada's public 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.

The intent of this document is to provide a resource to districts as they develop and implement CTE programs and curricula.

This program ensures the following thresholds are met:

- The CTE course 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 high-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.

- The CTE course and course sequence includes leadership and employability skills as an integral part of the curriculum.

- The CTE course and course sequence is part of a rigorous program of study and includes sufficient technical challenge to meet state and/or industry-standards.

The CTE program components include the following items:

- Program of Study
- State Skill Standards
- Employability Skills for Career Readiness Standards
- Career Technical Student Organizations (CTSOs)
- Curriculum Framework
- CTE Assessments:
    - Workplace Readiness Skills Assessment
    - End-of-Program Technical Assessment
- Certificate of Skill Attainment
- CTE Endorsement on a High School Diploma
- CTE College Credit

NEVADA DEPARTMENT OF EDUCATION

CURRICULUM FRAMEWORK FOR

AUTOMATION TECHNOLOGY

PROGRAM INFORMATION

Program Title:	**Automation Technology**
State Skill Standards:	**Automation Technology**
Standards Reference Code:	**AT**
Career Cluster:	**Manufacturing**
Career Pathway:	**Production**
Program Length:	**3 Levels (L1, L2, L3c)**
Program Assessments:	**Automation Technology**
	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 Automation Technology industry.

The program includes the following state standards:

- Nevada CTE Skill Standards: **Automation Technology**
- Employability Skills for Career Readiness
- Nevada Academic Content Standards (alignment shown in the Nevada CTE Skill Standards):
    - Science (based on the Next Generation Science Standards)
    - English Language Arts (based on the Common Core State Standards)
    - Mathematics (based on the Common Core State Standards)
- 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 http://www.careertech.org/career-clusters/glance/careerclusters.html

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 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 and has a designated level. Complete program sequences are essential for the successful delivery of all state standards in each program area.

AUTOMATION TECHNOLOGY

Core Course Sequence

AUTOMATION TECHNOLOGY	LEVEL
Automation Technology I	L1
Automation Technology II	L2
Automation Technology III	L3C

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 and has a designated level. A program does not have to utilize all of the complementary courses in order for their students to complete their program of study. Complete program sequences are essential for the successful delivery of all state standards in each program area.

AUTOMATION TECHNOLOGY

Core Course Sequence with Complementary Courses

AUTOMATION TECHNOLOGY	LEVEL
Automation Technology I	L1
Automation Technology II	L2
Automation Technology III	L3C
Automation Technology Advanced Studies*	AS

*Complementary Courses

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 by the letter "C". (e.g., Level = L3C) (Paragraph (d) of Subsection 1 of NAC 389.800)

END-OF-PROGRAM TECHNICAL ASSESSMENT

An end-of-program technical assessment has been developed 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 by the letter "C". (e.g., Level = L3C) (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 COURSE:
RECOMMENDED STUDENT PERFORMANCE STANDARDS

COURSE INFORMATION:

COURSE TITLE:	**Automation Technology I**
ABBR. NAME:	**Automation I**
CREDITS:	**1**
LEVEL:	**L1**
CIP CODE:	**14.4201**
PREREQUISITE:	**NONE**
CTSO:	**SkillsUSA**

COURSE DESCRIPTION:

This course introduces students to the fundamentals of automation technologies. Areas of emphasis include lab safety, the engineering design process, power systems, basic automation systems, and basic automation control devices.

TECHNICAL STANDARDS:

CONTENT STANDARD 1.0 :	**IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES**
Performance Standard 1.1 :	Demonstrate General Lab Safety Rules and Procedures
Performance Indicators :	1.1.1-1.1.19
Performance Standard 1.2 :	Identify and Utilize Hand Tools
Performance Indicators :	1.2.1-1.2.5
Performance Standard 1.3 :	Identify and Utilize Power Tools and Equipment
Performance Indicators :	1.3.1-1.3.5
CONTENT STANDARD 2.0 :	**INTRODUCTION TO AUTOMATION**
Performance Standard 2.1 :	Describe the History of Automation
Performance Indicators :	2.1.1-2.1.2
Performance Standard 2.2 :	Investigate Related Careers in Automation
Performance Indicators :	2.2.1, 2.2.3
Performance Standard 2.4 :	Interpret Schematics and Technical Drawings
Performance Indicators :	2.4.1
Performance Standard 2.5 :	Investigate the Engineering Design Process
Performance Indicators :	2.5.1-2.5.2
Performance Standard 2.6 :	Investigate Materials Used in Automation Systems
Performance Indicators :	2.6.1-2.6.2
Performance Standard 2.7 :	Identify fundamental Automation Components and Systems
Performance Indicators :	2.7.1-2.7.2

        CONTENT STANDARD 3.0 :   **ELECTRONICS FOR AUTOMATION**

Performance Standard 3.1 :   Apply Fundamentals of Electricity

    Performance Indicators :   3.1.1-3.1.3, 3.1.6

Performance Standard 3.2 :   Apply Fundamentals of Electronics

    Performance Indicators :   3.2.1-3.2.3

        CONTENT STANDARD 4.0 :   **CHARACTERIZE AUTOMATION CONTROL DEVICES**

Performance Standard 4.1 :   Investigate Motors in Automated Systems

    Performance Indicators :   4.1.1-4.1.2

Performance Standard 4.2 :   Investigate Fluid Power Systems

    Performance Indicators :   4.2.1-4.2.2

Performance Standard 4.3 :   Investigate Sensors and Actuators

    Performance Indicators :   4.3.1-4.3.2

Performance Standard 4.4 :   Investigate Switches and Relays

    Performance Indicators :   4.4.1

        CONTENT STANDARD 6.0 :   **INTRODUCTION TO ROBOTIC SYSTEMS**

Performance Standard 6.1 :   Explore Robotic Systems in Automation

    Performance Indicators :   6.1.1-6.1.2, 6.1.5

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: Reading Standards for Literacy in Science and Technical Subjects

        Writing Standards for Literacy in Science and Technical Subjects

        Speaking and Listening

    Mathematics: Mathematical Practices

    Science: Science and Engineering Practices

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

CORE COURSE:
RECOMMENDED STUDENT PERFORMANCE STANDARDS

COURSE INFORMATION:

COURSE TITLE:	**Automation Technology II**
ABBR. NAME:	**Automation II**
CREDITS:	**1**
LEVEL:	**L2**
CIP CODE:	**14.4201**
PREREQUISITE:	**Automation Technology I**
CTSO:	**SkillsUSA**

COURSE DESCRIPTION:

This course is a continuation of Automation Technology I. This course provides intermediate automation technology students the ability to further their skills and knowledge levels. Areas of study focus on the integration of mechanical, electrical, hydraulic and robotic systems. The appropriate use of technology and industry-standard equipment is an integral part of this course.

TECHNICAL STANDARDS:

CONTENT STANDARD 2.0 :	**INTRODUCTION TO AUTOMATION**
Performance Standard 2.1 :	Describe the History of Automation
Performance Indicators :	2.1.3
Performance Standard 2.2 :	Investigate Related Careers in Automation
Performance Indicators :	2.2.2
Performance Standard 2.3 :	Analyze Ethics in Automation
Performance Indicators :	2.3.1-2.3.2
Performance Standard 2.4 :	Interpret Schematic and Technical Drawings
Performance Indicators :	2.4.2
Performance Standard 2.5 :	Investigate the Engineering Design Process
Performance Indicators :	2.5.4
Performance Standard 2.6 :	Investigate Materials Used in Automation Systems
Performance Indicators :	2.6.3-2.6.4
Performance Standard 2.7 :	Identify Fundamental Automation Components and Systems
Performance Indicators :	2.7.3-2.7.4
CONTENT STANDARD 3.0 :	**ELECTRONICS FOR AUTOMATION**
Performance Standard 3.1 :	Apply Fundamentals of Electricity
Performance Indicators :	3.1.4-3.1.5, 3.1.7-3.1.9
Performance Standard 3.2 :	Apply Fundamentals of Electronics
Performance Indicators :	3.2.4, 3.2.6-3.2.7

CONTENT STANDARD 4.0 :   **CHARACTERIZE AUTOMATION CONTROL DEVICES**

Performance Standard 4.1 :   Investigate Motors in Automated Systems

Performance Indicators :   4.1.3-4.1.4

Performance Standard 4.2 :   Investigate Fluid Power Systems

Performance Indicators :   4.2.3-4.2.4

Performance Standard 4.3 :   Investigate Sensors and Actuators

Performance Indicators :   4.3.3

Performance Standard 4.4 :   Investigate Switches and Relays

Performance Indicators :   4.4.2-4.4.4

Performance Standard 4.5 :   Explore Programmable Logic Controllers

Performance Indicators :   4.5.1-4.5.2

CONTENT STANDARD 5.0 :   **MODEL CONTROL SYSTEMS**

Performance Standard 5.1 :   Demonstrate Control Technology and Automation Principles

Performance Indicators :   5.1.1, 5.1.4

CONTENT STANDARD 6.0 :   **INTRODUCTION TO ROBOTIC SYSTEMS**

Performance Standard 6.1 :   Explore Robotic Systems in Automation

Performance Indicators :   6.1.3

Performance Standard 6.2 :   Determine Components in Robotic Systems for Automation

Performance Indicators :   6.2.1, 6.2.4-6.2.5

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: Reading Standards for Literacy in Science and Technical Subjects

Writing Standards for Literacy in Science and Technical Subjects

Speaking and Listening

Mathematics: Mathematical Practices

Science: Science and Engineering Practices

Engineering Design

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

CORE COURSE:
RECOMMENDED STUDENT PERFORMANCE STANDARDS

COURSE INFORMATION:

COURSE TITLE:	**Automation Technology III**
ABBR. NAME:	**Automation III**
CREDITS:	**1**
LEVEL:	**L3C**
CIP CODE:	**14.4201**
PREREQUISITE:	**Automation Technology II**
PROGRAM ASSESSMENTS:	**AUTOMATION TECHNOLOGY**
	WORKPLACE READINESS SKILLS
CTSO:	**SkillsUSA**

COURSE DESCRIPTION:

This course is a continuation of Automation Technology II. This course provides advanced automation technology students with more in-depth skill development. Students will explore the use of robotics, programmable logic controllers, and the principles of automation and how they apply to multiple industries. The appropriate use of technology and industry-standard equipment is an integral part of this course. Upon successful completion students will have acquired entry-level skills for employment and be prepared for postsecondary education.

TECHNICAL STANDARDS:

CONTENT STANDARD 2.0 : INTRODUCTION TO AUTOMATION

Performance Standard 2.3 : Analyze Ethics in Automation
Performance Indicators : 2.3.3-2.3.4

Performance Standard 2.4 : Interpret Schematics and Technical Drawings
Performance Indicators : 2.4.3-2.4.4

Performance Standard 2.5 : Investigate the Engineering Design Process
Performance Indicators : 2.5.3, 2.5.5

Performance Standard 2.7 : Identify Fundamental Automation Components and Systems
Performance Indicators : 2.7.5

CONTENT STANDARD 3.0 : ELECTRONICS FOR AUTOMATION

Performance Standard 3.2 : Apply Fundamentals of Electronics
Performance Indicators : 3.2.5

CONTENT STANDARD 4.0 : CHARACTERIZE AUTOMATION CONTROL DEVICES

Performance Standard 4.5 : Explore Programmable Logic Controllers
Performance Indicators : 4.5.3-4.5.5

CONTENT STANDARD 5.0 : MODEL CONTROL SYSTEMS

Performance Standard 5.1 : Demonstrate Control Technology and Automation Principles
Performance Indicators : 5.1.2-5.1.3, 5.1.5-5.1.10

Performance Standard 5.2 : Demonstrate Diagnostic and Troubleshooting Practices
Performance Indicators : 5.2.1-5.2.10

CONTENT STANDARD 6.0 :   **INTRODUCTION TO ROBOTIC SYSTEMS**

Performance Standard 6.2 :   Determine Components in Robotic Systems for Automation

    Performance Indicators :   6.2.2-6.2.3

Performance Standard 6.3 :   Construct a Robotic System for Automation

    Performance Indicators :   6.3.1-6.3.4

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

Science: Science and Engineering Practices

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

COMPLEMENTARY COURSE(S):
RECOMMENDED STUDENT PERFORMANCE STANDARDS

Programs that utilize the complementary courses can include the following courses. The Advanced Studies course allows for additional study through investigation and in-depth research.

COURSE INFORMATION:

COURSE TITLE:	**Automation Technology Advanced Studies**
ABBR. NAME:	**Automation AS**
CREDITS:	**1**
LEVEL:	**AS**
CIP CODE:	**14.4201**
PREREQUISITE:	**Automation Technology III**
CTSO:	**SkillsUSA**

COURSE DESCRIPTION:

This course is offered to students who have achieved all content standards in a program whose desire is 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
- Participation in an internship or job shadowing opportunities
- Explore college and career opportunities
- Complete a capstone project