ELECTRONIC ENGINEERING CURRICULUM FRAMEWORK

Project Lead The Way

This document was prepared by:

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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 are part of a rigorous program of study and include 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
- Curriculum Frameworks
- Technical Assessment
- Certification of Program Completion

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.

NEVADA DEPARTMENT OF EDUCATION
CURRICULUM FRAMEWORK FOR ELECTRONIC ENGINEERING

PROGRAM TITLE:	**ELECTRONIC ENGINEERING**
STATE SKILL STANDARDS:	**ELECTRONIC ENGINEERING**
STANDARDS REFERENCE CODE:	**ELENG**
CAREER CLUSTER:	**SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS**
CAREER PATHWAY:	**ENGINEERING & TECHNOLOGY**
PROGRAM LENGTH:	**3 LEVELS (L1, L2, L3C)**
PROGRAM ASSESSMENTS:	**ELECTRONIC ENGINEERING** **WORKPLACE READINESS SKILLS**
CTSO:	**SKILLSUSA**
GRADE LEVEL:	**9-12**
AVAILABLE INDUSTRY CERTIFICATIONS/LICENSES PROVIDERS:	

PROGRAM PURPOSE

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

The program includes the following state standards:

- Nevada CTE Skill Standards: Electronic Engineering
- Employability Skills for Career Readiness
- Common Core State Standards (alignment shown in the Nevada CTE Skill Standards)
- Nevada State Science Standards (alignment shown in the Nevada CTE Skill 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.

CAREER AND TECHNICAL STUDENT ORGANIZATIONS (CTSO)

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. (per NAC 389.800 section 3a)

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.

ELECTRONIC ENGINEERING Core Course Sequence	
COURSE NAME	**LEVEL**
PLTW-Introduction to Engineering Design	L1
PLTW-Principles of Engineering	L2
PLTW-Digital Electronics	L3C
PLTW-Engineering Design and Development*	AS

*Complementary Courses

EMPLOYABILITY SKILLS FOR CAREER READINESS

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 should be part of each course of the CTE program. Students are expected to demonstrate proficiency in the Employability Skills for Career Readiness upon completion of a CTE course sequence.
(per NAC 389.800 section 1)

CTE / ACADEMIC CREDIT

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 schools course catalog or contact the local high school counselor for more information. (per NAC 389.672)

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”. (Level = L3C) (per NAC 389.800 section 1)

ARTICULATION

An articulation agreement is an officially approved agreement that matches coursework between the secondary and postsecondary institutions. These agreements are designed to help students make a smooth transition from secondary to postsecondary institutions. The articulation agreement identifies the specific courses that align and are accepted for credit at the postsecondary level.

Each local high school and college maintains their agreements. Please refer to the local high schools course catalog or contact the local high school counselor for more information.

CERTIFICATION OF PROGRAM COMPLETION

A student must be given a certificate upon completion of a course of study in an occupation which states the level of performance the pupil has attained in specific skills identified by representatives of business or industry. (per NAC 389.800 section 3b)

CTE GRADUATION ENDORSEMENT

A student qualifies for a CTE endorsement on their high school diploma after successfully completing the CTE program of study and meeting all academic requirements governing receipt of a standard diploma.
(per NAC 389.815)

CORE COURSE:
RECOMMENDED STUDENT PERFORMANCE STANDARDS

COURSE TITLE:	**PLTW-Introduction to Engineering Design**
ABBR. NAME:	**PLTW ENG DESG**
CREDITS:	**1**
LEVEL:	**L1**
CIP CODE:	**14.0101**
PREREQUISITE:	**None**
CTSO:	**SkillsUSA**

COURSE DESCRIPTION

Schools must be affiliated with the Project Lead The Way™ program to offer this course

This course is the entry-level course of the Project Lead the Way™ Pathway to Engineering curriculum. The major focus of IED is the design process and its application. Through hands-on projects, students apply engineering standards and document their work. Students use industry standard 3D modeling software to help them design solutions to solve proposed problems, document their work using an engineer's notebook, and communicate solutions to peers and members of the professional community.

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 : ASSESS THE IMPACT OF ENGINEERING ON SOCIETY

Performance Standard 2.1 : Describe History of Engineering

Performance Indicators : 2.1.1-2.1.4

Performance Standard 2.2 : Investigate Related Careers in Engineering

Performance Indicators : 2.2.1-2.2.4

Performance Standard 2.3 : Analyze Ethics in Engineering

Performance Indicators : 2.3.1-2.3.4

CONTENT STANDARD 3.0 : ANALYZE THE ENGINEERING DESIGN PROCESS

Performance Standard 3.1 : Interpret the Engineering Design Process

Performance Indicators : 3.1.1-3.1.5

CONTENT STANDARD 4.0 : CONSTRUCT ENGINEERING DOCUMENTATION

Performance Standard 4.1 : Demonstrate Freehand Technical Sketching Techniques

Performance Indicators : 4.1.1-4.1.6

Performance Standard 4.2 : Demonstrate Measuring and Scaling Techniques

Performance Indicators : 4.2.1-4.2.6

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Performance Standard 4.3 : Utilize Engineering Documentation Procedures
Performance Indicators : 4.3.1-4.3.4
Performance Standard 4.4 : Produce Technical Drawings
Performance Indicators : 4.4.1-4.4.8
Performance Standard 4.5 : Demonstrate Modeling Techniques
Performance Indicators : 4.5.1-4.5.4

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 COMMON CORE AND STATE SCIENCE 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

***** Refer to the Electronic Engineering Standards for alignment by performance indicator

CORE COURSE:
RECOMMENDED STUDENT PERFORMANCE STANDARDS

COURSE TITLE:	**PLTW-Principles of Engineering**
ABBR. NAME:	**PLTW PRIN ENG**
CREDITS:	**1**
LEVEL:	**L2**
CIP CODE:	**14.0101**
PREREQUISITE:	**PLTW-Introduction to Engineering Design**
CTSO:	**SkillsUSA**

COURSE DESCRIPTION

Schools must be affiliated with the Project Lead The Way™ program to offer this course

This course is a continuation of the Project Lead the Way™ Pathway to Engineering curriculum. This survey course exposes students to major concepts they'll encounter in a post-secondary engineering course of study. Topics include mechanisms, energy, statics, materials, and kinematics. They develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges, document their work and communicate solutions.

TECHNICAL STANDARDS

CONTENT STANDARD 5.0 : INVESTIGATE MATERIAL PROPERTIES

Performance Standard 5.1 : Identify Material Properties and Science

Performance Indicators : 5.1.1-5.1.5

Performance Standard 5.2 : Analyze the Strengths of Materials

Performance Indicators : 5.2.1-5.2.12

CONTENT STANDARD 6.0 : APPLY FUNDAMENTAL POWER SYSTEMS AND ENERGY PRINCIPLES

Performance Standard 6.1 : Investigate Power Systems and Energy Forms

Performance Indicators : 6.1.1-6.1.13

Performance Standard 6.2 : Identify and Utilize Basic Mechanical Systems

Performance Indicators : 6.2.1-6.2.6

Performance Standard 6.3 : Identify and Utilize Energy Sources and Applications

Performance Indicators : 6.3.1-6.3.12

Performance Standard 6.4 : Identify and Utilize Machine Control Systems

Performance Indicators : 6.4.1-6.4.6

Performance Standard 6.5 : Identify and Utilize Basic Fluid Systems

Performance Indicators : 6.5.1-6.5.9

Performance Standard 6.6 : Identify Thermodynamics

Performance Indicators : 6.6.1-6.6.5

CONTENT STANDARD 7.0 : APPLY STATISTICS AND KINEMATIC PRINCIPLES

Performance Standard 7.1 : Utilize Statistics

Performance Indicators : 7.1.1-7.1.9

Performance Standard 7.2 : Utilize Kinematic Principles

Performance Indicators : 7.2.1-7.2.6

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 COMMON CORE AND STATE SCIENCE 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
Number & Quantity – Vector and Matrix Quantities
Algebra – Reasoning with Equations and Inequalities
Algebra – Arithmetic with Polynomials and Rational Expressions
Statistics and Probability – Conditional Probability and the Rules of Probability
Statistics and Probability – Interpreting Categorical and Quantitative Data

***** Refer to the Electronic Engineering Standards for alignment by performance indicator

CORE COURSE:
RECOMMENDED STUDENT PERFORMANCE STANDARDS

COURSE TITLE:	**PLTW-Digital Electronics**
ABBR. NAME:	**PLTW DIG ELEC**
CREDITS:	**1**
LEVEL:	**L3C**
CIP CODE:	**15.0303**
PREREQUISITE:	**PLTW-Principles of Engineering**
PROGRAM ASSESSMENTS:	**ELECTRONIC ENGINEERING** **WORKPLACE READINESS SKILLS**
CTSO:	**SkillsUSA**

COURSE DESCRIPTION

Schools must be affiliated with the Project Lead The Way™ program to offer this course*

This course is a continuation of the Project Lead the Way™ Pathway to Engineering curriculum. Digital electronics is the foundation of all modern electronic devices such as mobile phones, MP3 players, laptop computers, digital cameras and high-definition televisions. Students are introduced to the process of combinational and sequential logic design, engineering standards and technical documentation.

TECHNICAL STANDARDS

CONTENT STANDARD 8.0 : APPLY FUNDAMENTAL DIGITAL ELECTRONIC TECHNIQUES AND PROCESSES

Performance Standard 8.1 : Apply Fundamental Electronic Principles

Performance Indicators : 8.1.1-8.1.13

Performance Standard 8.2 : Identify Fundamental Analog Principles

Performance Indicators : 8.2.1-8.2.6

Performance Standard 8.3 : Identify Fundamental Digital Principles

Performance Indicators : 8.3.1-8.3.5

CONTENT STANDARD 9.0 : APPLY ADVANCED DIGITAL ELECTRONIC TECHNIQUES AND PROCESSES

Performance Standard 9.1 : Analyze Combinational Logic Circuits

Performance Indicators : 9.1.1-9.1.9

Performance Standard 9.2 : Analyze Sequential Logic Circuits

Performance Indicators : 9.2.1-9.2.7

Performance Standard 9.3 : Apply Microcontroller Principles

Performance Indicators : 9.3.1-9.3.9

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 COMMON CORE AND STATE SCIENCE 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
Algebra – Creating Equations
Algebra – Reasoning with Equations and Inequalities
Functions – Linear, Quadratic, and Exponential Models

***** Refer to the Electronic Engineering Standards for alignment by performance indicator

COMPLEMENTARY COURSE(S):

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 TITLE:	**PLTW-Engineering Design and Development**
ABBR. NAME:	**PLTW ENG DESG DEV**
CREDITS:	**1**
LEVEL:	**AS**
CIP CODE:	**14.0101**
PREREQUISITE:	**PLTW-Digital Electronics**
CTSO:	**SkillsUSA**

COURSE DESCRIPTION

Schools must be affiliated with the Project Lead The Way™ program to offer this course*

This course is the capstone course of the Project Lead the Way™ Pathway to Engineering curriculum. In this capstone course, students work in teams to design and develop an original solution to a valid open-ended technical problem by applying the engineering design process. Students perform research to choose, validate, and justify a technical problem. After carefully defining the problem, teams design, build, and test their solutions while working closely with industry professionals who provide mentoring opportunities. Finally, student teams present and defend their original solution to an outside panel. Upon successful completion of this program, students will be prepared for entry into an Engineering program at the college level.

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 shadow opportinities
- Explore college and career opportunities
- Complete a capstone project