Engineering Foundations 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 Engineering Foundations

Program Information

Program Title:	**Engineering Foundations**
State Skill Standards:	**Engineering Foundations**
Standards Reference Code:	**ENG**
Career Cluster:	**Science, Technology, Engineering, and Mathematics**
Career Pathway:	**Engineering and Technology, Science and Mathematics**
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 Engineering Foundations industry.

The program includes the following state standards:

- Nevada CTE Skill Standards: Engineering Foundations
- 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.

Engineering Foundations

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	Engineering Foundations I	ENG FOUND I	14.0101	21	005	G	1.00	12	21005G1.0012
R	Engineering Foundations II	ENG FOUND II	14.0101	21	005	G	1.00	22	21005G1.0022
C	Engineering Foundations Advanced Study	ENG FOUND AS	14.0101	21	005	E	1.00	11	21005E1.0011
C	CTE Work Experience – Science Technology Engineering Mathematics	WORK EXPER STEM	99.0015	21	998	G	1.00	11	21998G1.0011
C	Industry-Recognized Credential – Engineering Foundations	IRC ENG FOUND	14.0101	21	999	E	1.00	11	21999E1.0011

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: **Engineering Foundations I**
Abbreviated Name: **ENG FOUND I**
Credits: **1**
Prerequisite: **None**
CTSO: **SkillsUSA**

Course Description

This course is the entry-level course of the Engineering curriculum. The major focus of this course 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: **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: 2.1.1-2.1.20
Performance Standard 2.2: Use Tools and Equipment Safely
Performance Indicators: 2.2.1-2.2.5
CONTENT STANDARD 3.0: **ASSESS THE IMPACT OF ENGINEERING ON SOCIETY**
Performance Standard 3.1: Investigate Related Careers in Engineering
Performance Indicators: 3.1.1-3.1.6
Performance Standard 3.2: Analyze Ethics in Engineering
Performance Indicators: 3.2.1-3.2.5
CONTENT STANDARD 4.0: **ANALYZE THE ENGINEERING DESIGN PROCESS**
Performance Standard 4.1: Interpret the Engineering Design Process
Performance Indicators: 4.1.1-4.1.5

CONTENT STANDARD 5.0:	**CONSTRUCT ENGINEERING DOCUMENTATION**
Performance Standard 5.1:	Demonstrate Freehand Technical Sketching Techniques
Performance Indicators:	5.1.1-5.1.5
Performance Standard 5.2:	Demonstrate Measuring and Scaling Techniques
Performance Indicators:	5.2.1-5.2.6
Performance Standard 5.3:	Use Engineering Documentation Procedures
Performance Indicators:	5.3.1-5.3.4
Performance Standard 5.4:	Produce Technical Drawings
Performance Indicators:	5.4.1-5.4.9
Performance Standard 5.5:	Demonstrate Modeling Techniques
Performance Indicators:	5.5.1-5.5.4

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 the Nevada Academic Content Standards*

English Language Arts:	Reading Standards for Information Text
	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
Science:	Science and Engineering Practices

*Refer to the Engineering Foundations Standards for alignment by performance indicator.

Course Information

Course Title: **Engineering Foundations II**
Abbreviated Name: **ENG FOUND II**
Credits: **1**
Prerequisite: **Engineering Foundations I**
Program Assessments: **TBD**
Workplace Readiness Skills
CTSO: **SkillsUSA**

Course Description

This course is a continuation of the Engineering curriculum. This survey course exposes students to major concepts they will encounter in a postsecondary 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 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 6.0: **INVESTIGATE MATERIAL PROPERTIES**
Performance Standard 6.1: Identify Material Properties and Science
Performance Indicators: 6.1.1-6.1.5
Performance Standard 6.2: Analyze the Strengths of Materials
Performance Indicators: 6.2.1-6.2.12
CONTENT STANDARD 7.0: **APPLY FUNDAMENTAL POWER SYSTEMS AND ENERGY PRINCIPLES**
Performance Standard 7.1: Investigate Power Systems and Energy Forms
Performance Indicators: 7.1.1-7.1.13
Performance Standard 7.2: Identify and Use Basic Mechanical Systems
Performance Indicators: 7.2.1-7.2.6
Performance Standard 7.3: Identify and Use Energy Sources and Applications
Performance Indicators: 7.3.1-7.3.12
Performance Standard 7.4: Identify and Use Machine Control Systems
Performance Indicators: 7.4.1-7.4.6
Performance Standard 7.5: Identify and Use Basic Fluid Systems
Performance Indicators: 7.5.1-7.5.9

Performance Standard 7.6:	Identify Thermodynamics
Performance Indicators:	7.6.1-7.6.5
CONTENT STANDARD 8.0:	**APPLY STATISTICS AND KINEMATIC PRINCIPLES**
Performance Standard 8.1:	Use Statistics
Performance Indicators:	8.1.1-8.1.9
Performance Standard 8.2:	Use Kinematic Principles
Performance Indicators:	8.2.1-8.2.6

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 the Nevada Academic Content Standards*

English Language Arts:	Reading Standards for Information Text
	Speaking and Listening Standards
	Writing Standards for Literacy in Science and Technical Subjects
Mathematics:	Mathematical Practices
	Algebra
	Numbers and Quantity
	Statistics and Probability
Science:	Science and Engineering Practices

*Refer to the Engineering Foundations 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: **Engineering Foundations Advanced Studies**

Abbreviated Name: **ENG FOUND AS**

Credits: **1**

Prerequisite: **Completion of Engineering Foundations 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 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:

- Participation in an internship or job shadow opportunities
- Complete a capstone project
- Participate in individual/team design competitions
- Explore college and career opportunities

Course Information

Course Title: CTE Work Experience – Science Technology Engineering Mathematics

Abbreviated Name: WORK EXPER STEM

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 – Engineering Foundations

Abbreviated Name: IRC ENG FOUND

Credits: 1

Prerequisite: Completion of Engineering Foundations 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 Engineering Foundations 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.