NEBRASKA CAREER AND TECHNICAL EDUCATION

CTE®
Learning that works for Nebraska

NEBRASKA DEPARTMENT OF EDUCATION

SKILLED AND TECHNICAL SCIENCES

PROGRAM OF STUDY STANDARDS

2023–2024

ARCHITECTURE & CONSTRUCTION

ENERGY & ENGINEERING

MANUFACTURING

TRANSPORTATION, DISTRIBUTION, & LOGISTICS

NEBRASKA CAREER AND TECHNICAL EDUCATION STATE MODEL PROGRAMS OF STUDY

CAREER FIELD OVERVIEW

The Skilled and Technical Sciences Career Field Area provides opportunities for students to deepen their understanding of topics in areas such as architectural and design drafting, construction, electricity/electronics, home maintenance, welding, manufacturing, engineering, energy, technical education, and transportation, distribution, and logistics.

PROGRAMS OF STUDY

Programs of Study are the primary delivery model for Career and Technical Education (CTE) in Nebraska. They include a sequence of courses which progresses in specificity and rigor and are updated regularly to align with Nebraska's workforce needs and economic development priorities. This document includes the programs of study and course-based standards for the Skilled and Technical Sciences career field. These state model programs of study were developed to:

- Assist secondary schools in creating meaningful sequences of courses that adequately prepare individuals for seamless transitions to postsecondary education and careers eliminating duplication of coursework;
- Assist students in identifying appropriate courses for high school and postsecondary education that lead to their chosen career;
- Encourage collaboration between secondary and postsecondary education through curricular alignment;
- Offer opportunities for high-quality workplace experiences aligned to students' career interests;
- Promote the advancement of early postsecondary opportunities (including dual-credit courses) for all students; and
- Support postsecondary education options for students to further prepare them for successful transitions to their future careers.

Nebraska's programs of study are organized around Nebraska's CTE Model, which provides a way for students to explore the diversity of career options available to them.

NEBRASKA CAREER AND TECHNICAL EDUCATION MODEL

1 CORE ACADEMICS AND CAREER READINESS

At the center of the NCE Model is the expectation for all students to develop a solid academic core. The next ring identifies specific career readiness standards and practices that prepare students for success in postsecondary education as well as entrepreneurship/employment.

2 CAREER FIELDS

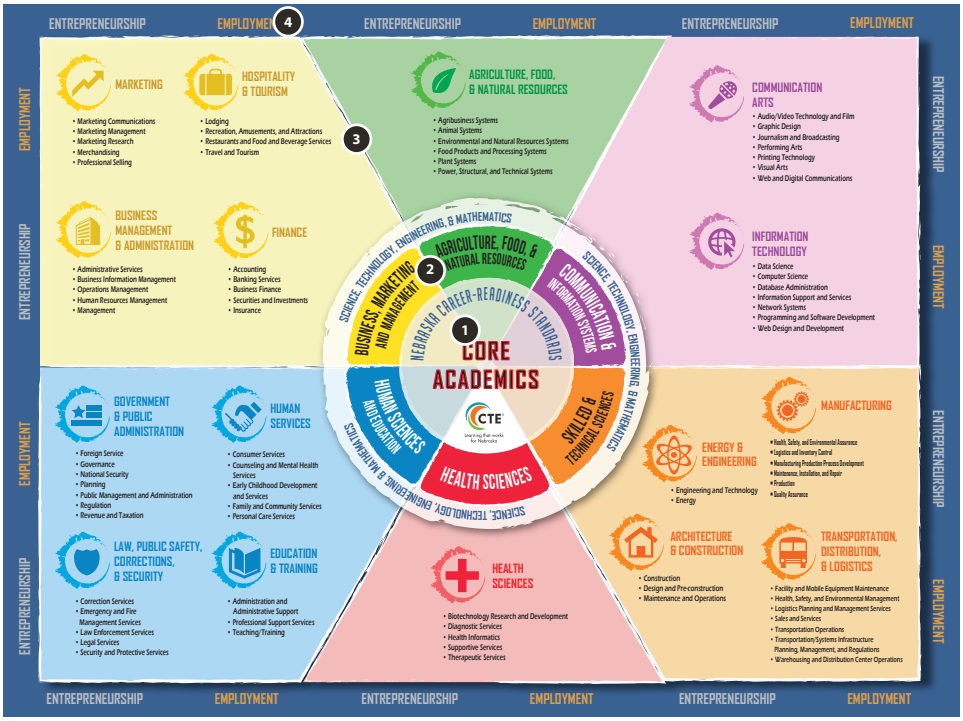
The six career fields represent broad sectors of the job market on which students may choose to focus.

3 CAREER CLUSTERS

Each career field is composed of career clusters radiating out from it. The clusters are more specific segments of the labor market. Each cluster is a grouping of careers that focus on similar subjects or similar skills. A basic understanding and exploration of each of the clusters will provide students with a solid foundation for career decision-making to conceptualize the entire world of work.

4 EMPLOYABILITY AND ENTREPRENEURSHIP

Career education provides the opportunity to gain the knowledge and skills for both employment and entrepreneurship. The reality for Nebraska and the United States is that entrepreneurship will help ensure economic growth and vitality. By infusing entrepreneurship competencies, career education is helping create the next generation of America's innovators and entrepreneurs.



The model is a visual map of "career fields" and "career clusters/pathways" and organizes the 16 National Career Clusters into six broad sectors of entrepreneurship and employment:

- Agriculture, Food and Natural Resources
- Business, Marketing and Management
- Communication and Information Systems
- Health Sciences
- Human Sciences and Education
- Skilled and Technical Sciences

These fields break down into more specific Career Clusters, Pathways and Occupational Specialties. The model provides a way for:

- Students to explore the diversity of career options available to them.
- Students to begin to prepare for their career with plans for secondary and post-secondary education.
- Schools to organize curriculum into Programs of Study that prepare students for opportunities in Nebraska's economy.

COURSE SEQUENCING

The courses within the State Model Program of Study are intended to be offered sequentially, to allow learners to build upon foundational knowledge and skills learned in introductory and intermediate courses and applied in more advanced capstone coursework. Non-duplicative sequences of courses ensure students transition to postsecondary education without duplication of classes and content. CTE enrollment data is collected at the course level. Students who participate and concentrate in CTE generally have more positive outcomes such as higher graduation rates along with postsecondary success.

Introductory Courses

Introductory courses set the foundation for a program of study by introducing students to broad foundational knowledge relative to an occupational area and career field.

Intermediate Courses

Intermediate courses build on the foundational knowledge of Introductory courses to further develop the academic, technical, and career readiness skills within a particular career field and occupational area.

Capstone Courses

Capstone courses are occupationally specific and further develop the necessary and required academic, technical, and career readiness skills needed for seamless transitions to postsecondary education and employment. Capstone courses often provide opportunities for students to earn postsecondary credit.

Levels of Participation

CTE Participant

A student who has earned one or more credits in any career and technical education program area.

CTE Concentrator

A secondary student who, in grades 9 through 12, has earned credit in at least two courses in a single career cluster program at the intermediate or capstone level.

State Model Programs of Study are coordinated, nonduplicative sequences of academic and technical content at the secondary and postsecondary levels that incorporate challenging State academic standards, address both academic and technical knowledge and skills, including Nebraska's Career Readiness Skills, are aligned with the needs of industries in Nebraska's economy, progress in specificity, have multiple entry and exit points that incorporate credentialing, and culminate in the attainment of a recognized postsecondary credential.

COURSE-BASED STANDARDS

Individual CTE courses, which make up the sequence of courses for Programs of Study, include content area standards and indicators to provide a framework for quality teaching and learning. While not required by state law, districts are encouraged to adopt these State Model Programs of Study and their related course-based standards. CTE State Model Programs of Study and course-based standards are revised on a five-year cycle to remain responsive to the rapid advances and needs of business and industry, help students explore a variety of postsecondary options and corresponding entrance requirements to help identify their next steps, and to align to changes in postsecondary programs.

Standards

At the highest level of generality, content area standards include a set of broad, overarching content-based statements that describe the basic cognitive, affective, or psychomotor expectations of students. They reflect long-term goals for learning.

Indicators

Under each standard are indicators, which further describe what a student must know and be able to do to meet the standard. Indicators are performance-based statements that provide educators with a clear understanding of the expected level of student learning and guidance. Indicators provide guidance for an assessment of student learning.

EXPANDED LEARNING OPPORTUNITIES

Expanded learning opportunities build on, support, and enhance learning within and outside of regular school programming. They are a critical component of Nebraska's educational landscape and should be intentionally supported to further develop students' college and career readiness. To signal aligned expanded learning opportunities, each Program of Study identifies additional areas where students may desire to personalize their program and take additional coursework or work-based learning that aligns with their interests. These expanded learning opportunities are not considered part of a Program of Study nor are they required, but rather a meaningful opportunity for students to continue to learn after completing the Program of Study sequence of courses within the context of their career interests. Along with aligned coursework, two prominent expanded learning opportunities include participating in Work-based Learning or a Career and Technical Student Organization.

Work-Based Learning

Work-Based Learning (WBL) connects learners with employers to prepare them for success in an everchanging workplace. WBL is a planned program of meaningful experiences related to the career interests of learners that enables them to acquire knowledge and skills in a real or simulated work setting. It requires strong partnerships between schools, colleges, and local employers. WBL is learning through work, not simply learning about work. Expanding high-quality WBL opportunities for students is one of Nebraska's CTE strategic priorities and is a program quality accountability indicator. Nebraska CTE affirms WBL as a critical component of career development. Throughout the State Model Programs of Study, courses where WBL is embedded into the class is noted in the course title (e.g., "Architecture & Construction Work-Based Learning Experience"). It is also signaled as an expanded learning opportunity across all programs of study.

Career And Technical Student Organizations

Career and Technical Student Organizations (CTSOs) are an extension of classroom instruction—applying classroom learning to real-world experiences. CTSOs provide opportunities for all students to develop career readiness skills through activities, competitions, and community service. Nebraska recognizes seven CTSOs aligned with the state's Programs of Study and career field areas. These include:

SkillsUSA NEBRASKA

SKILLED AND TECHNICAL SCIENCES

FFA

AGRICULTURE, FOOD, AND NATURAL RESOURCES

NEBRASKA DECA

NEBRASKA FBLA·ΦBA

BUSINESS, MARKETING, AND MANAGEMENT

NEBRASKA FBLA·ΦBA

COMMUNICATION AND INFORMATION SYSTEMS

hosa future health professionals NEBRASKA

HEALTH SCIENCES

EDUCATORS RISING NEBRASKA

FCCLA NEBRASKA STATE ASSOCIATION

HUMAN SCIENCES AND EDUCATION

CAREER READINESS STANDARDS

Embedded into the State Model Programs of Study and courses are the Nebraska Career Readiness standards. These standards rest on important "practices and proficiencies" with long-standing importance in career education. These standards and related practices are not limited to formal CTE programs nor to the middle school or high school level. Rather, these standards and practices should be used over and over again with increasing complexity and relevance by students as they progress through their educational pathway. The standards themselves do not dictate curriculum, pedagogy or delivery of content. Schools and colleges may handle the teaching and assessing of these standards in many different ways.

THE CAREER READY INDIVIDUAL...

1. Applies appropriate academic and technical skills
2. Communicates effectively and appropriately
3. Contributes to employer and community success
4. Makes sense of problems and perseveres in solving them
5. Uses critical thinking
6. Demonstrates innovation and creativity
7. Models ethical leadership and effective management
8. Works productively in teams and demonstrates cultural competency
9. Utilizes technology
10. Manages personal career development
11. Attends to personal and financial well-being

ARCHITECTURE AND CONSTRUCTION CLUSTER

Program of Study Name	Introductory Course	Intermediate Course	Capstone Course	Expanded Learning Opportunity
ARCHITECTURAL DESIGN (Pages 10–17)	100100 - Introduction to Skilled and Technical Sciences	100140 - Architectural Design 1, OR 090109 - Home Design and Interiors (FCS)	100141 - Architectural Design 2	320703 - Architecture & Construction Work-Based Learning Experience
CONSTRUCTION (Pages 18–26)	100100 - Introduction to Skilled and Technical Sciences, OR 100405 - Residential Electricity	1000110 - Construction Trades 1, OR 016000 - Power, Structural, & Technology Systems Fundamentals (AFNR)	100120 - Construction Trades 2	320703 - Architecture & Construction Work-Based Learning Experience

ENERGY AND ENGINEERING CLUSTER

Program of Study Name	Introductory Course	Intermediate Course	Capstone Course	Expanded Learning Opportunity
ENERGY (Pages 27–35)	100406 - Fundamentals of Energy	100408 - Sustainable Energy	100407 - Physics & Mathematics of Energy	320707 - Energy & Engineering Work-Based Learning Experience
ENGINEERING (Pages 36–47)	100100 - Introduction to Skilled and Technical Sciences, OR 103191- Engineering Design & Systems Thinking, OR 100160 - PLTW Principles of Engineering, OR 100161 - PLTW Introduction to Engineering Design	103192 - Engineering Problem Solving, OR 103194 - Robotics, OR 100164 - PLTW Aerospace Engineering, OR 100162 - PLTW Civil Engineering & Architecture, OR 101901 - PLTW Computer Integrated Manufacturing, OR 100403 - PLTW Digital Electronics	103193 - Systems Engineering & Project Management, OR 103195 - Advanced Robotics, OR 100163 - PLTW Engineering Design & Development	320707 - Energy & Engineering Work-Based Learning Experience

MANUFACTURING CLUSTER

Program of Study Name	Introductory Course	Intermediate Course	Capstone Course	Expanded Learning Opportunity
MANUFACTURING (Pages 48–84)	100100 - Introduction to Skilled and Technical Sciences, OR 100130 - Drafting & Design	101920 - Manufacturing Processes - Woods, OR 101400 - Manufacturing Processes - Metals, OR 101950 - Manufacturing Processes - Plastics, OR 100401 - Introduction to Electronics	101921 - Manufacturing Production - Woods, OR 101401 - Manufacturing Production - Metals, OR 101951 - Manufacturing Production - Plastics, OR 101900 - Introduction to Mechatronics, OR 100402 - Advanced Electronics, OR	320715 - Manufacturing Work-Based Learning Experience 101922 - Advanced Manufacturing & Fabrication – Woods, OR 101402 - Advanced Manufacturing & Fabrication – Metals, OR 101952 - Advanced Manufacturing & Fabrication – Plastics
WELDING (Pages 85–95)	100100 - Introduction to Skilled and Technical Sciences	101930 - Welding 1, OR 016004 - Welding (AFNR)	101940 - Welding 2, OR 016005 - Metals & Fabrication (AFNR)	101941 - Welding 3, OR 320715 - Manufacturing/ Welding Work-Based Learning Experience

TRANSPORTATION, DISTRIBUTION, AND LOGISTICS CLUSTER

Program of Study Name	Introductory Course	Intermediate Course	Capstone Course	Expanded Learning Opportunity
TRANSPORTATION, DISTRIBUTION, & LOGISTICS - SUPPLY CHAIN (Pages 96–100)	101601 - Introduction to Transportation, Distribution & Logistics	100610 - Distribution & Logistics	101650 - Business Logistics	320717- Transportation, Distribution & Logistics Work-Based Learning Experience
TRANSPORTATION, DISTRIBUTION, & LOGISTICS - TECHNICIAN (Pages 101–116)	100100 - Introduction to Skilled and Technical Sciences, OR Power Equipment, OR 016003 - Power, Structural, and Technical Systems (AFNR)	101600 - Transportation 1	101620 - Transportation 2, OR 101640 - Collision Repair	101630 - Transportation 3, OR 320717 - Transportation, Distribution, & Logistics Work-Based Learning Experience

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES

COURSE DESCRIPTION

This introductory course provides the skills and technical knowledge for a beginning student in areas of industry, safety, material, equipment, and process understanding. This entry level course helps students gain a foundation in all areas of Skilled and Technical Sciences including Architecture and Construction; Energy and Engineering; Manufacturing; and Transportation, Distribution, and Logistics.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.20.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.20.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.20.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.20.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.
- STS.HS.20.1.d Employ the safe application of tools and machines.
- STS.HS.20.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.20.1.f Demonstrate proper handling and storing of materials.

STS.HS.20.2 Identify career opportunities in Skilled and Technical Sciences areas.

- STS.HS.20.2.a Identify responsibilities and characteristics of professionals in a skilled and technical sciences industry.
- STS.HS.20.2.b Describe work behaviors needed to be employable in a skilled and technical sciences industry.
- STS.HS.20.2.c Identify the training, education, certification, and licensing requirements for various careers in a skilled and technical sciences industry.
- STS.HS.20.2.d Identify high wage, high demand, and high skill careers in skilled and technical sciences.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES (cont.)

STS.HS.20.3 Apply appropriate academic and technical skills to produce a product.

STS.HS.20.3.a Employ project-related math operations and formulas.

STS.HS.20.3.b Employ effective verbal, written, and/or visual communication skills.

STS.HS.20.3.c Define course content vocabulary.

STS.HS.20.3.d Conduct the accurate use of measurement tools.

STS.HS.20.4 Identify the materials, tools, machines, and equipment required to produce a product.

STS.HS.20.4.a Identify types of materials to be used for various products.

STS.HS.20.4.b Identify types of fasteners for various products.

STS.HS.20.4.c Identify types of adhesives for various products.

STS.HS.20.4.d Identify types of finishes for various products.

STS.HS.20.4.e Identify the correct tools, machines, and equipment appropriate for a specific operation or process.

STS.HS.20.5 Produce a product(s).

STS.HS.20.5.a Interpret working drawings of a product to be produced.

STS.HS.20.5.b Select the proper materials adhesives, fasteners and finishes for a product.

STS.HS.20.5.c Demonstrate the proper tool, machine, or equipment selection and usage for each corresponding operation needed to produce a product.

STS.HS.20.5.d Execute a plan of procedure.

ARCHITECTURAL DESIGN 1

COURSE DESCRIPTION

This intermediate course provides students with an introduction into Computer-Aided-Drafting (CAD) and the foundation for architectural design. Architectural styles, design and construction procedures as well as knowledge of working drawings needed to build a structure will be included.

Target Grades: 10-12.

STANDARDS AND INDICATORS:

STS.HS.6.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.6.1.a Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.6.1.b Identify office safety hazards.

STS.HS.6.1.c Employ appropriate Personal Protective Equipment (PPE).

STS.HS.6.1.d Employ proper ergonomics.

STS.HS.6.1.e Complete applicable safety assessment with 100% accuracy.

STS.HS.6.2 Identify architectural career opportunities.

STS.HS.6.2.a Identify the primary duties and attributes of an architect or architectural technician.

STS.HS.6.2.b Describe the various careers within the architectural profession (i.e., drafting technician, designer, project manager, architect, landscape architect, and interior designer) and the training and certification needed for each.

STS.HS.6.2.c Identify the relationships between all stakeholders involved in a construction project.

STS.HS.6.2.d Identify positive work behaviors and personal qualities needed to be employable.

ARCHITECTURAL DESIGN 1 (cont.)

STS.HS.6.3 Apply math terminology, functions, and formulas to architectural design.

STS.HS.6.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.6.3.b Apply arithmetic operations.

STS.HS.6.3.c Solve decimal/fraction conversions.

STS.HS.6.3.d Apply algebraic skills to solve problems involving area, volume, and angles.

STS.HS.6.3.e Explain scale using architect or engineer scales.

STS.HS.6.4 Identify architectural career opportunities.

STS.HS.6.4.a Identify the primary duties and attributes of an architect or architectural technician.

STS.HS.6.4.b Describe the various careers within the architectural profession (i.e., drafting technician, designer, project manager, architect, landscape architect, and interior designer) and the training and certification needed for each.

STS.HS.6.4.c Identify the relationships between all stakeholders involved in a construction project.

STS.HS.6.4.d Identify positive work behaviors and personal qualities needed to be employable.

STS.HS.6.5 Utilize drafting and design technology.

STS.HS.6.5.a Employ the appropriate technology tools (i.e., CAD, SolidWorks, Fusion 360, Inventor, etc.) for conveying information, solving problems, and expediting workplace processes.

STS.HS.6.5.b Employ basic computer and information technology skills used in the drafting industry.

STS.HS.6.5.c Employ ethical digital citizenship.

ARCHITECTURAL DESIGN 1 (cont.)

STS.HS.6.6 Analyze architectural styles across time.

STS.HS.6.6.a Identify design principles, elements, and architectural styles.

STS.HS.6.6.b Identify the building materials, locations, and design that have historically influenced architecture.

STS.HS. 6.6.c Identify the influence that historical buildings have on today's architecture.

STS.HS.6.7 Identify typical building design and construction methods and practices.

STS.HS.6.7.a Identify terms and definitions commonly used in the architectural profession.

STS.HS.6.7.b Identify various digital drafting and modeling options (i.e., CAD/BIM).

STS.HS.6.7.c Identify the types of materials, their properties, and applications used in building construction.

STS.HS.6.7.d Identify different types of fasteners, adhesives, and finishes.

STS.HS.6.8 Communicate design solutions.

STS.HS.6.8.a Identify common line types, symbols, and components that comprise architectural construction working drawings.

STS.HS.6.8.b Identify dimensions on working drawing.

STS.HS.6.8.c Create multi-page working drawings.

STS.HS.6.8.d Employ correct annotation of line type, section line labels, and dimensions.

STS.HS.6.8.e Create shaded and rendered presentation drawings.

ARCHITECTURAL DESIGN 2

COURSE DESCRIPTION

This capstone course allows students to create working drawings for residential construction and systems that meet industry standards and codes. Students will create working drawings of residential construction systems.

Target Grades: 11-12.

STANDARDS AND INDICATORS:

STS.HS.7.1 Apply safety principles, practices, and guidelines to the work environment.

STS.HS.7.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.7.7.b Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.7.1.c Identify office safety hazards.

STS.HS.7.1.d Employ appropriate Personal Protective Equipment (PPE).

STS.HS.7.1.e Employ proper ergonomics.

STS.HS.7.2 Identify architectural career opportunities.

STS.HS.7.2.a Identify the primary duties and attributes of an architect or architectural technician.

STS.HS.7.2.b Identify various careers within the architectural profession as well as the training and certification needed for each.

STS.HS.7.2.c Identify the relationships between stakeholders involved in a construction project.

STS.HS.7.2.d Identify positive work behaviors and personal qualities needed to be employable.

ARCHITECTURAL DESIGN 2 (cont.)

STS.HS.7.3 Apply math terminology, functions, and formulas to architectural design.

STS.HS.7.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.7.3.b Apply arithmetic operations.

STS.HS.7.3.c Solve decimal/fraction conversions.

STS.HS.7.3.d Apply mathematical functions used to solve problems.

STS.HS.7.3.e Interpret scale using architect or engineer scales.

STS.HS.7.4 Explain site characteristics and how they affect building design and land development.

STS.HS.7.4.a Identify the impact of infrastructure (i.e., storm water runoff, pedestrian and vehicular access).

STS.HS.7.4.b Explain environmental factors essential to design and construction.

STS.HS.7.5 Explain residential and commercial building systems.

STS.HS.7.5.a Identify general categories of structural systems in residential and commercial buildings.

STS.HS.7.5.b Explain code requirements and constraints as they pertain to current local and national building codes.

STS.HS.7.5.c Identify alternative construction methods and materials.

ARCHITECTURAL DESIGN 2 (cont.)

STS.HS.7.6 Create design solutions.

STS.HS.7.6.a Create multipage working drawings.

STS.HS.7.6.b Create applicable drawing views, details, schedules, notes, and index tables.

STS.HS.7.6.c Employ correct annotation of line type, section line labels, and dimensions.

STS.HS.7.7 Produce a project proposal.

STS.HS.7.7.a Employ architectural terminology in all communication.

STS.HS.7.7.b Employ correct annotation of line type, section line labels, and dimensions.

STS.HS.7.7.c Create shaded and rendered presentation drawings.

STS.HS.7.7.d Identify plan review requirements needed to obtain a building permit.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES

COURSE DESCRIPTION

This introductory course provides the skills and technical knowledge for a beginning student in areas of industry, safety, material, equipment, and process understanding. This entry level course helps students gain a foundation in all areas of Skilled and Technical Sciences including Architecture and Construction; Energy and Engineering; Manufacturing; and Transportation, Distribution, and Logistics.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.20.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.20.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.20.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.20.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.
- STS.HS.20.1.d Employ the safe application of tools and machines.
- STS.HS.20.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.20.1.f Demonstrate proper handling and storing of materials.

STS.HS.20.2 Identify career opportunities in Skilled and Technical Sciences areas.

- STS.HS.20.2.a Identify responsibilities and characteristics of professionals in a skilled and technical sciences industry.
- STS.HS.20.2.b Describe work behaviors needed to be employable in a skilled and technical sciences industry.
- STS.HS.20.2.c Identify the training, education, certification, and licensing requirements for various careers in a skilled and technical sciences industry.
- STS.HS.20.2.d Identify high wage, high demand, and high skill careers in skilled and technical sciences.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES (cont.)

STS.HS.20.3 Apply appropriate academic and technical skills to produce a product.

STS.HS.20.3.a Employ project-related math operations and formulas.

STS.HS.20.3.b Employ effective verbal, written, and/or visual communication skills.

STS.HS.20.3.c Define course content vocabulary.

STS.HS.20.3.d Conduct the accurate use of measurement tools

STS.HS.20.4 Identify the materials, tools, machines, and equipment required to produce a product.

STS.HS.20.4.a Identify types of materials to be used for various products.

STS.HS.20.4.b Identify types of fasteners for various products.

STS.HS.20.4.c Identify types of adhesives for various products.

STS.HS.20.4.d Identify types of finishes for various products.

STS.HS.20.4.e Identify the correct tools, machines, and equipment appropriate for a specific operation or process.

STS.HS.20.5 Produce a product(s).

STS.HS.20.5.a Interpret working drawings of a product to be produced.

STS.HS.20.5.b Select the proper materials adhesives, fasteners and finishes for a product.

STS.HS.20.5.c Demonstrate the proper tool, machine, or equipment selection and usage for each corresponding operation needed to produce a product.

STS.HS.20.5.d Execute a plan of procedure.

RESIDENTIAL ELECTRICTRICAL WIRING

COURSE DESCRIPTION

This introductory course provides an overview of the theory, terminology, tools, and practical experience in the skills needed for a career in the field of residential wiring. Emphasis will be placed on electrical safety, types of electricity components used in residential wiring, and an opportunity to practice the knowledge and skills learned in the class.

Target Grades: 10-12.

STANDARDS AND INDICATORS:

STS.HS.14.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.14.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.14.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.14.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.
- STS.HS.14.1.d Employ the safe application of tools and machines.
- STS.HS.14.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.14.1.f Demonstrate proper handling and storing of materials.
- STS.HS.14.1.g List the techniques and practices used to prevent fires.

STS.HS.14.2 Identify career opportunities in the electrical industry.

- STS.HS.14.2.a Describe work behaviors needed to be employable.
- STS.HS.14.2.b Identify employment trends in the electrical industry.
- STS.HS.14.2.c Identify the responsibilities and characteristics of professionals in the electrical industry.
- STS.HS.14.2.d Identify the training, education, certification, and licensing requirements for careers in the electrical industry.

RESIDENTIAL ELECTRICTRICAL WIRING (cont.)

STS.HS.14.3 Demonstrate the use of electrical communications.

STS.HS.14.3.a Recall vocabulary related to the electrical environment.

STS.HS.14.3.b Apply math calculations for measurements and OHM'S law.

STS.HS.14.3.c Interpret electrical symbols, plans, drawings, and codes.

STS.HS.14.4 Demonstrate the proper uses of electrical components.

STS.HS.14.4.a Employ National Electric Code (NEC) standards when wiring electrical components.

STS.HS.14.4.b Demonstrate the rough-in of electrical devices to meet NEC standards.

STS.HS.14.4.c Demonstrate the connection of electrical devices to meet NEC standards.

STS.HS.14.4.d Demonstrate the installation of electrical devices to meet NEC standards.

STS.HS.14.5 Demonstrate the use of materials, tools, and equipment needed in electricity.

STS.HS.14.5.a Demonstrate the proper use of electrical tools and equipment.

STS.HS.14.5.b Identify the different types of wires used for electricity.

STS.HS.14.5.c Demonstrate the proper use of electrical hardware.

STS.HS.14.5.d Demonstrate the proper use of low and high voltage circuits.

CONSTRUCTION TRADES 1

COURSE DESCRIPTION

This intermediate course provides an overview of construction materials, tools, and processes needed for a basic construction project. This course will lay the groundwork for higher-level construction projects and for careers in the construction industry.

Target Grades: 10-12.

STANDARDS AND INDICATORS:

STS.HS.10.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.10.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.10.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.10.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.10.1.d Employt the safe application of tools and machines.

STS.HS.10.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.10.1.f Demonstrate proper handling and storing of materials.

STS.HS.10.1.g Demonstrate proper use of a ladder.

STS.HS.10.2 Identify career opportunities in the construction industry.

STS.HS.10.2.a Describe work behaviors needed to be employable.

STS.HS.10.2.b Identify employment trends in various construction sectors (e.g., residential, commercial, industrial, energy, green technologies, etc.).

STS.HS.10.2.c Identify the responsibilities and characteristics of professionals in the construction industry.

STS.HS.10.2.d Identify the training, education, certification, and licensing requirements for various careers in the construction industry.

CONSTRUCTION TRADES 1 (cont.)

STS.HS.10.3 Demonstrate use of construction communications.

STS.HS.10.3.a Interpret construction terminology.

STS.HS.10.3.b Identify construction tools and equipment.

STS.HS.10.3.c Interpret construction plans, drawings, and schedules.

STS.HS.10.4 Summarize building systems and components.

STS.HS.10.4.a Identify construction materials needed to complete a project (i.e., dimensional, engineered, and steel.

STS.HS.10.4.b Identify different types of fasteners, adhesives, and finishes needed to complete a project.

STS.HS.10.5 Demonstrate the building process

STS.HS.10.5.a Identify, receive, and inspect materials.

STS.HS.10.5.b Apply math functions and formulas to complete tasks.

STS.HS.10.5.c Correctly and accurately use tools and equipment to perform material takeoff (MTO) from the drawings and meeting specifications.

STS.HS.10.5.d Construct a project using dimensional, engineered, or steel components.

CONSTRUCTION TRADES 2

COURSE DESCRIPTION

This capstone course is designed for the student pursuing a career as a construction professional and combines technical skills with planning and management to prepare the student for all stages of a construction project.

Target Grades: 11-12.

STANDARDS AND INDICATORS:

STS.HS.11.1 Apply safety principles, practices, philosophy and guidelines to the work environment.

STS.HS.11.1.a	Complete applicable safety assessment with 100% accuracy.
STS.HS.11.1.b	Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
STS.HS.11.1.c	Employ eye protection in compliance with Neb. Rev. Statute 79-715.
STS.HS.11.1.d	Employ the safe application of tools and machines.
STS.HS.11.1.e	Explain the main hazards that are possible in the lab setting.
STS.HS.11.1.f	Demonstrate proper handling and storing of materials.
STS.HS.11.1.g	Demonstrate proper use of a ladder.
STS.HS.11.1.h	Identify the role of OSHA in establishing and maintaining safe work environments.

STS.HS.11.2 Identify career opportunities in the construction industry.

STS.HS.11.2.a	Describe work behaviors needed to be employable.
STS.HS.11.2.b	Identify employment trends in various construction sectors (residential, commercial, industrial, energy, green technologies, etc.).
STS.HS.11.2.c	Identify the responsibilities and characteristics of professionals in the construction industry.
STS.HS.11.2.d	Identify the training, education, certification and licensing requirements for various careers in the construction industry.

CONSTRUCTION TRADES 2 (cont.)

STS.HS.11.3 Demonstrate use of construction communications.

STS.HS.11.3.a Define construction terminology.

STS.HS.11.3.b Identify construction tools and equipment needed for a project.

STS.HS.11.3.c Interpret construction plans, drawings and schedules.

STS.HS.11.4 Summarize building systems and components.

STS.HS.11.4.a Identify and inspect construction materials needed to complete a project (ie. dimensional, engineered, or steel).

STS.HS.11.4.b Identify different types of fasteners, adhesives, and finishes needed to complete a project.

STS.HS.11.4.c Describe the building systems needed to complete a construction project.

STS.HS.11.4.d Describe the building components needed to complete a construction project (i.e. trusses, joists, beams, etc.).

STS.HS.11.4.e Identify emerging building trends/technology.

STS.HS.11.5 Identify building codes and permitting processes.

STS.HS.11.5.a Identify local, state, and national building regulations and codes.

STS.HS.11.5.b Describe the requirements needed to obtain a building permit.

STS.HS.11.5.c Identify appropriate building inspections.

CONSTRUCTION TRADES 2 (cont.)

STS.HS.11.6 Demonstrate the building process.

STS.HS.11.6.a Identify, receive, and inspect materials.

STS.HS.11.6.b Apply math functions and formulas to complete job/workplace tasks.

STS.HS.11.6.c Employ tools and equipment to perform material takeoff (MTO) from the drawings and meeting specifications.

STS.HS.11.6.d Construct a project using dimensional, engineered, or steel components.

STS.HS.11.7 Install construction sub-systems (ie. electrical, plumbing, HVAC, etc.).

STS.HS.11.7.a Identify, receive, and inspect materials.

STS.HS.11.7.b Apply math functions and formulas to complete construction job/workplace tasks.

STS.HS.11.7.c Install structural, mechanical, and finish sub-systems correctly to meet current local, state, and national codes.

FUNDAMENTALS OF ENERGY

COURSE DESCRIPTION

This introductory course will focus on the various types, principles, and distribution methods of energy and energy systems.

Target Grades: 9-12.

STANDARDS AND INDICATORS:

STS.HS.17.1 Apply safety principles, practice, philosophy, and guidelines to the work environment.

STS.HS.17.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.17.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.17.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.

STS.HS.17.1.d Employ the safe application of tools and machines.

STS.HS.17.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.17.1.f Demonstrate proper handling and storing of materials.

STS.HS.17.2 Determine career opportunities in the energy field.

STS.HS.17.2.a Identify opportunities and employment trends in various energy sectors.

STS.HS.17.2.b Identify the training, education, certification, and licensing requirements for energy occupation choices.

STS.HS.17.2.c Identify the responsibilities of professionals in the energy industry.

FUNDAMENTALS OF ENERGY (cont.)

STS.HS.17.3 Summarize the history of energy generation and distribution.

STS.HS.17.3.a Summarize the history of electric power generation and distribution.

STS.HS.17.3.b Summarize the history of fluid and liquid fuel production and distribution.

STS.HS.17.3.c Identify emerging trends in energy generation and distribution.

STS.HS.17.4 Identify legal and societal influences affecting energy production and distribution.

STS.HS.17.4.a Identify the legal factors that impact the production and distribution of energy.

STS.HS.17.4.b Identify the impact society has on energy production and distribution.

STS.HS.17.4.c Identify the design and project creation process for energy production and distribution.

STS.HS.17.5 Classify the types of energy and their uses.

STS.HS.17.5.a Identify the seven forms of energy.

STS.HS.17.5.b Recognize energy transformations in various settings.

STS.HS.17.5.c Recognize renewable and non-renewable energy sources.

STS.HS.17.5.d Identify the law of conservation of energy.

FUNDAMENTALS OF ENERGY (cont.)

STS.HS.17.6 Appraise energy storage and distribution methods.

STS.HS.17.6.a Summarize the components of an energy delivery system.

STS.HS.17.6.b Identify key pieces of equipment used in the distribution and storage of fluid fuels and electrical power.

STS.HS.17.6.c Compare centralized power generation to distributed generation.

STS.HS.17.7 Apply units of measure used in the evaluation of energy production and delivery.

STS.HS.17.7.a Calculate equations using Ohm's Law.

STS.HS.17.7.b Calculate equations using thermal energy formulas.

STS.HS.17.8 Produce an energy-related product or structure.

STS.HS.17.8.a Generate sketches and plans for an energy-related product or structure.

STS.HS.17.8.b Determine structural requirements, specifications, and estimate costs of structures.

STS.HS.17.8.c Execute plans for construction of energy related products or structures.

SUSTAINABLE ENERGY

COURSE DESCRIPTION

This intermediate course will focus on energy sources and alternative forms of energy and their uses.

Target Grades: 10-12.

STANDARDS AND INDICATORS:

STS.HS.30.1 Apply safety principles, practice, philosophy, and guidelines to the work environment.

STS.HS.30.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.30.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.30.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.

STS.HS.30.1.d Employ the safe application of tools and machines.

STS.HS.30.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.30.1.f Demonstrate proper handling and storing of materials.

STS.HS.30.2 Identify career opportunities in the sustainable energy field.

STS.HS.30.2.a Identify the responsibilities of professionals in the sustainable energy industry.

STS.HS.30.2.b Identify opportunities and employment trends in various sustainable energy sectors.

STS.HS.30.2.c Identify the training, education, certification, and licensing requirements for occupation choices within sustainable energy.

SUSTAINABLE ENERGY (cont.)

STS.HS.30.3 Explain societal topics concerning sustainable energy.

STS.HS.30.3.a Summarize energy systems' relation to the conservation and interaction of energy and matter.

STS.HS.30.3.b Explain the responsibilities and considerations involved in making decisions in the energy industry.

STS.HS.30.3.c Explain the economic and political ramifications of the energy industry.

STS.HS.30.4 Identify the various types of energy and their uses.

STS.HS.30.4.a Explain the characteristics of wind as an energy source.

STS.HS.30.4.b Explain how solar energy may be used as an alternative energy source.

STS.HS.30.4.c Explain how geothermal energy can be used as a form of energy.

STS.HS.30.4.d Explain how biomass is used as an alternative form of energy.

STS.HS.30.4.e Explain how water may be used in energy production.

STS.HS.30.5 Determine the materials, tools, and equipment needed to manufacture a sustainable energy product.

STS.HS.30.5.a Determine types of materials, fasteners, adhesives, and finishes needed to produce a specific product related to sustainable energy.

STS.HS.30.5.b Determine the correct tools and equipment needed to produce a specific product related to sustainable energy.

STS.HS.30.5.c Identify the components of an effective sustainable energy product construction plan.

SUSTAINABLE ENERGY (cont.)

STS.HS.30.6 Explain current trends and information related to sustainable energy production and distribution.

STS.HS.30.6.a Identify pros and cons of sustainable energy.

STS.HS.30.6.b Locate, organize, and reference reliable information from various sources to communicate trends in sustainable energy.

STS.HS.30.7 Execute accurate measurements using math and measurement tools pertaining to sustainable energy.

STS.HS.30.7.a Identify types of measurement tools used in sustainable energy.

STS.HS.30.7.b Demonstrate the accurate use of measurement and layout tools to 1/16" precision.

STS.HS.30.7.c Solve math functions and formulas to complete tasks within the sustainable energy field.

STS.HS.30.8 Construct a sustainable energy related product or structure.

STS.HS.30.8.a Create sketches and plans for a sustainable energy related product or structure.

STS.HS.30.8.b Determine structural requirements, specifications, and estimate costs of structures.

STS.HS.30.8.c Interpret plans to construct, maintain, or repair sustainable energy-related products or structures.

STS.HS.30.8.d Properly plan, build, and maintain the product or structure.

PHYSICS AND MATHEMATICS OF ENERGY

COURSE DESCRIPTION

This capstone course provides the skills and technical knowledge for a student in areas of industry, safety, material, equipment, and process understanding in various energy industries. Students will use knowledge and skills from previous energy courses.

Target Grades: 9-12.

STANDARDS AND INDICATORS:

STS.HS.27.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.27.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.27.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.27.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.

STS.HS.27.1.d Employ the safe application of tools and machines.

STS.HS.27.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.27.1.f Demonstrate proper handling and storing of materials.

STS.HS.27.2 Identify career opportunities in fields related to the physics and mathematics of energy.

STS.HS.27.2.a Identify the responsibilities and characteristics of professionals in the energy industry.

STS.HS.27.2.b Identify career opportunities in the energy field.

STS.HS.27.2.c Identify the training, education, certification, and licensing requirements for various careers in the energy industry.

PHYSICS AND MATHEMATICS OF ENERGY (cont.)

STS.HS.27.3 Execute accurate measurements using measurement tools.

STS.HS.27.3.a Identify types of measurement tools.

STS.HS.27.3.b Categorize measurement tools by use.

STS.HS.27.3.c Demonstrate the accurate use of measurement and layout tools to 1/16" precision.

STS.HS.27.4 Apply principles of physics and mathematics to the energy industry.

STS.HS.27.4.a Identify the applications of physics in energy production, distribution, and use.

STS.HS.27.4.b Identify the applications of mathematics in energy production, distribution, and use.

STS.HS.27.4.c Apply principles of physics and mathematics to the problem solving and product creation process.

STS.HS.27.5 Apply appropriate academic and technical skills to energy-centric activities and projects.

STS.HS.27.5.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.27.5.b Solve decimal/fraction conversions.

STS.HS.27.5.c Employ math functions and formulas to complete an energy job and workplace tasks.

STS.HS.27.5.d Communicate principles and terminology associated with the study and use of mathematics and physics.

PHYSICS AND MATHEMATICS OF ENERGY (cont.)

STS.HS.27.6 Identify the materials, tools, and equipment needed to manufacture a product used in the energy industry.

STS.HS.27.6.a Determine types of materials, fasteners, adhesives, and finishes needed to produce an energy product.

STS.HS.27.6.b Determine the correct tools and equipment needed to produce a specific product.

STS.HS.27.6.c Identify components of an effective plan to build an energy product.

STS.HS.27.7 Produce an energy product.

STS.HS.27.7.a Devise a plan to build an energy product.

STS.HS.27.7.b Execute a plan to create an energy product.

STS.HS.27.7.c Identify the elements of a finished energy product.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES

COURSE DESCRIPTION

This introductory course provides the skills and technical knowledge for a beginning student in areas of industry, safety, material, equipment, and process understanding. This entry level course helps students gain a foundation in all areas of Skilled and Technical Sciences including Architecture and Construction; Energy and Engineering; Manufacturing; and Transportation, Distribution, and Logistics.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.20.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.20.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.20.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.20.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.
- STS.HS.20.1.d Employ the safe application of tools and machines.
- STS.HS.20.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.20.1.f Demonstrate proper handling and storing of materials.

STS.HS.20.2 Identify career opportunities in Skilled and Technical Sciences areas.

- STS.HS.20.2.a Identify responsibilities and characteristics of professionals in a skilled and technical sciences industry.
- STS.HS.20.2.b Describe work behaviors needed to be employable in a skilled and technical sciences industry.
- STS.HS.20.2.c Identify the training, education, certification, and licensing requirements for various careers in a skilled and technical sciences industry.
- STS.HS.20.2.d Identify high wage, high demand, and high skill careers in skilled and technical sciences.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES (cont.)

STS.HS.20.3 Apply appropriate academic and technical skills to produce a product.

STS.HS.20.3.a Employ project-related math operations and formulas.

STS.HS.20.3.b Employ effective verbal, written, and/or visual communication skills.

STS.HS.20.3.c Define course content vocabulary.

STS.HS.20.3.d Conduct the accurate use of measurement tools

STS.HS.20.4 Identify the materials, tools, machines, and equipment required to produce a product.

STS.HS.20.4.a Identify types of materials to be used for various products.

STS.HS.20.4.b Identify types of fasteners for various products.

STS.HS.20.4.c Identify types of adhesives for various products.

STS.HS.20.4.d Identify types of finishes for various products.

STS.HS.20.4.e Identify the correct tools, machines, and equipment appropriate for a specific operation or process.

STS.HS.20.5 Produce a product(s).

STS.HS.20.5.a Interpret working drawings of a product to be produced.

STS.HS.20.5.b Select the proper materials adhesives, fasteners and finishes for a product.

STS.HS.20.5.c Demonstrate the proper tool, machine, or equipment selection and usage for each corresponding operation needed to produce a product.

STS.HS.20.5.d Execute a plan of procedure.

ENGINEERING DESIGN AND SYSTEMS THINKING

COURSE DESCRIPTION

This course gives students the opportunity to develop skills and understanding of engineering. Students will learn about various elements of engineering design and how engineering requires systematic thinking. Topics will include safety, tools, math and science concepts, and engineering principles and processes.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.15.1 Apply safety principles, practice, philosophy, and guidelines to the work environment.

STS.HS.15.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.15.1.b Employ eye protection in compliance with Neb. Rev. Statute 79–715.

STS.HS.15.1.c Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.15.1.d Employ the safe application of tools and machines.

STS.HS.15.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.15.1.f Demonstrate proper handling and storing of materials.

STS.HS.15.2 Execute accurate measurements using measurement tools commonly used in engineering.

STS.HS.15.2.a Identify types of engineering measurement tools.

STS.HS.15.2.b Categorize engineering measurement tools by use.

STS.HS.15.2.c Demonstrate the accurate use of engineering measurement and layout tools to 1/16" precision.

ENGINEERING DESIGN AND SYSTEMS THINKING (cont.)

STS.HS.15.3 Solve math functions and formulas to complete engineering job/workplace tasks.

STS.HS.15.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.15.3.b Apply basic arithmetic operations.

STS.HS.15.3.c Solve decimal or fraction conversions.

STS.HS.15.4 Compare the primary engineering branches.

STS.HS.15.4.a Summarize each branch of engineering.

STS.HS.15.4.b Compare the engineering branches.

STS.HS.15.5 Explain engineering systems thinking.

STS.HS.15.5.a Define "system" in an engineering context.

STS.HS.15.5.b Explain a current system in an engineering context.

STS.HS.15.6 Produce an engineered solution.

STS.HS.15.6.a Identify engineering principles needed for a solution.

STS.HS.15.6.b Apply engineering principles.

STS.HS.15.6.c Identify engineering processes needed for a solution.

STS.HS.15.6.d Apply engineering processes.

STS.HS.15.6.e Apply task specific mathematical concepts.

STS.HS.15.6.f Apply task specific scientific concepts.

STS.HS.15.6.g Demonstrate proper use of engineering tools and software.

ENGINEERING PROBLEM-SOLVING

COURSE DESCRIPTION

This intermediate course exposes students to some of the major concepts that they will encounter in a postsecondary engineering course of study. Students will learn how to identify an engineering problem, research possible solutions, and determine the best solution for the problem.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.16.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.16.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.16.1.b Employ eye protection in compliance with Neb. Rev. Statute 79–715.

STS.HS.16.1.c Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.16.1.d Employ the safe application of tools and machines.

STS.HS.16.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.16.1.f Demonstrate proper handling and storing of materials.

STS.HS.16.2 Describe engineering as a profession.

STS.HS.16.2.a Identify opportunities and employment trends in the engineering branches.

STS.HS.16.2.b Identify training, education, certification, and licensing requirements for careers in the different engineering branches.

ENGINEERING PROBLEM-SOLVING (cont.)

STS.HS.16.3 Employ the engineering design process to solve an engineering problem.

STS.HS.16.3.a Define an engineering problem.

STS.HS.16.3.b Research possible solutions.

STS.HS.16.3.c Design viable solutions.

STS.HS.16.3.d Identify the materials, tools, emerging technologies, and equipment needed to manufacture a solution to an engineering problem.

STS.HS.16.3.e Solve mathematical and scientific problems required to create engineering solutions.

STS.HS.16.3.f Determine structural requirements and specifications.

STS.HS.16.3.g Estimate costs for the solution.

STS.HS.16.4 Explain professional engineering communications.

STS.HS.16.4.a Identify a concise problem statement.

STS.HS.16.4.b Explain the use of informal and formal presentations, using appropriate media, to engage and inform audiences.

STS.HS.16.4.c Explain the documentation of the design process and project work using engineering drawings, engineering standards, and documentation protocols.

ROBOTICS

COURSE DESCRIPTION

This intermediate course is designed to explore the current and future use, design, construction, operation, and use of robots and automation technology. Students will apply mathematics formulas and calculations to design and construct a robot.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.29.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.29.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.29.1.b Employ eye protection in compliance with Neb. Rev. Statute 79–715.
- STS.HS.29.1.c Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.29.1.d Employ the safe application of tools and machines.
- STS.HS.29.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.29.1.f Demonstrate proper handling and storing of materials.

STS.HS.29.2 Solve robotics-related mathematics.

- STS.HS.29.2.a Solve calculations using whole numbers, decimals, fractions, and complex numbers.
- STS.HS.29.2.b Solve basic arithmetic and measurement operations.
- STS.HS.29.2.c Solve decimal/fraction conversions.
- STS.HS.29.2.d Calculate area.
- STS.HS.29.2.e Calculate circumference.
- STS.HS.29.2.f Calculate average.

ROBOTICS (cont.)

STS.HS.29.3 Employ robotics-related science principles.

STS.HS.29.3.a Calculate fundamental electrical measurements using laws of electricity.

STS.HS.29.3.b Calculate torque.

STS.HS.29.3.c Calculate the center of gravity.

STS.HS.29.3.d Calculate mechanical advantage.

STS.HS.29.3.e Calculate gear ratios.

STS.HS.29.3.f Calculate angular momentum.

STS.HS.29.3.g Calculate trajectory.

STS.HS.29.4 Identify the different specialized areas of robotics.

STS.HS.29.4.a Summarize each specialized field of robotics.

STS.HS.29.4.b Identify the diversity of the robotics usage.

STS.HS.29.4.c Identify the education, certification, or licensure required in a robotics-related career.

STS.HS.29.5 Design and assemble automation or robots that are functionally and mechanically correct.

STS.HS.29.5.a Demonstrate use of a physical or simulated robot.

STS.HS.29.5.b Demonstrate basic programming concepts: variables, data structures, control structures, and syntax.

STS.HS.29.5.c Generate a mechanical solution for a robot to overcome a physical or simulated physics challenge.

STS.HS.29.5.d Generate a programming solution for a robot to overcome a physical or simulated autonomous challenge.

STS.HS.29.5.g Assemble various physical or simulated mechanisms to understand mechanical setups.

STS.HS.29.5.h Construct a physical or simulated fully functioning robot that has proof of concept through engineering documentation protocols.

SYSTEMS ENGINEERING AND PROJECT MANAGEMENT

COURSE DESCRIPTION

This is a capstone engineering research course in which students will design and develop an original solution to a valid open-ended technical problem by applying the engineering design process.

Target Grades 11-12.

STANDARDS AND INDICATORS:

STS.HS.31.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.31.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.31.1.b Employ eye protection in compliance with Neb. Rev. Statute 79-715.
- STS.HS.31.1.c Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.31.1.d Employ the safe application of tools and machines.
- STS.HS.31.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.31.1.f Demonstrate proper handling and storing of materials.

STS.HS.31.2 Identify career opportunities in engineering areas.

- STS.HS.31.2.a Identify responsibilities and characteristics of professionals in an engineering industry.
- STS.HS.31.2.b Describe work behaviors needed to be employable in an engineering industry.
- STS.HS.31.2.c Identify the training, education, certification, and licensing requirements for various careers in an engineering industry.
- STS.HS.31.2.d Identify high wage, high demand, and high skill careers in engineering.

SYSTEMS ENGINEERING AND PROJECT MANAGEMENT (cont.)

STS.HS.31.3 Employ a formal engineering design process to create a solution to an existing problem.

STS.HS.31.3.a Collaborate with industry experts, mentors, or advanced students.

STS.HS.31.3.b Demonstrate authentic engineering methods and documentation.

STS.HS.31.3.c Apply task-specific mathematical concepts.

STS.HS.31.3.d Apply task-specific scientific concepts.

STS.HS.31.3.e Complete a prototype or minimum viable product (MVP).

STS.HS.31.3.f Perform engineering tests to evaluate the prototype or MVP.

STS.HS.31.3.g Develop a marketing plan and production plan.

STS.HS.31.3.h Report on the importance of each step of the engineering process.

ADVANCED ROBOTICS

COURSE DESCRIPTION

This course is a capstone experience in which students engineer robot solutions to complete a task. This includes design, construction, and programming a robot.

Target Grades 11-12.

STANDARDS AND INDICATORS:

STS.HS.5.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.5.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.5.1.b Employ eye protection in compliance with Neb. Rev. Statute 79–715.
- STS.HS.5.1.c Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.5.1.d Employ the safe application of tools and machines.
- STS.HS.5.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.5.1.f Demonstrate proper handling and storing of materials.

STS.HS.5.2 Identify careers in robotics.

- STS.HS.5.2.a Identify robotics industry vocabulary.
- STS.HS.5.2.b Identify the responsibilities of robotics professionals.
- STS.HS.5.2.c Identify the education, certification, or licensure required in a robotics-related career.

ADVANCED ROBOTICS (cont.)

STS.HS.5.3 Create a robotic solution (physical or simulated), using a formal engineering design process, to solve an existing problem.

STS.HS.5.3.a Demonstrate authentic engineering methods and documentation.

STS.HS.5.3.b Apply task-specific mathematical concepts.

STS.HS.5.3.c Apply task-specific scientific concepts.

STS.HS.5.3.d Explain each step of the design process.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES

COURSE DESCRIPTION

This introductory course provides the skills and technical knowledge for a beginning student in areas of industry, safety, material, equipment, and process understanding. This entry level course helps students gain a foundation in all areas of Skilled and Technical Sciences including Architecture and Construction; Energy and Engineering; Manufacturing; and Transportation, Distribution, and Logistics.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.20.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.20.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.20.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.20.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.20.1.d Employ the safe application of tools and machines.

STS.HS.20.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.20.1.f Demonstrate proper handling and storing of materials.

STS.HS.20.2 Identify career opportunities in Skilled and Technical Sciences areas.

STS.HS.20.2.a Identify responsibilities and characteristics of professionals in a skilled and technical sciences industry.

STS.HS.20.2.b Describe work behaviors needed to be employable in a skilled and technical sciences industry.

STS.HS.20.2.c Identify the training, education, certification, and licensing requirements for various careers in a skilled and technical sciences industry.

STS.HS.20.2.d Identify high wage, high demand, and high skill careers in skilled and technical sciences.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES (cont.)

STS.HS.20.3 Apply appropriate academic and technical skills to produce a product.

STS.HS.20.3.a Employ project-related math operations and formulas.

STS.HS.20.3.b Employ effective verbal, written, and/or visual communication skills.

STS.HS.20.3.c Define course content vocabulary.

STS.HS.20.3.d Conduct the accurate use of measurement tools

STS.HS.20.4 Identify the materials, tools, machines, and equipment required to produce a product.

STS.HS.20.4.a Identify types of materials to be used for various products.

STS.HS.20.4.b Identify types of fasteners for various products.

STS.HS.20.4.c Identify types of adhesives for various products.

STS.HS.20.4.d Identify types of finishes for various products.

STS.HS.20.4.e Identify the correct tools, machines, and equipment appropriate for a specific operation or process.

STS.HS.20.5 Produce a product(s).

STS.HS.20.5.a Interpret working drawings of a product to be produced.

STS.HS.20.5.b Select the proper materials adhesives, fasteners and finishes for a product.

STS.HS.20.5.c Demonstrate the proper tool, machine, or equipment selection and usage for each corresponding operation needed to produce a product.

STS.HS.20.5.d Execute a plan of procedure.

DRAFTING AND DESIGN

COURSE DESCRIPTION

This introductory course builds the skills necessary to understand ideas being communicated through drawings and documents, and in turn, convey ideas, duties, and tasks to others in a form representing the industry. Students will use and follow industry-specific verbal and visual skills to accomplish workplace/jobsite communications. Students will review traditional project phases and various roles within them to plan for and implement phases within a project. Students will develop working drawings that will be used in design and manufacturing. Computer-aided drafting/design (CADD) may be used.

Target Grades 11-12.

STANDARDS AND INDICATORS:

STS.HS.13.1 Apply safety principles, practice, philosophy, and guidelines to the work environment.

STS.HS.13.1.a Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.13.1.b Identify office safety hazards.

STS.HS.13.1.c Employ appropriate Personal Protective Equipment (PPE).

STS.HS.13.1.d Employ proper ergonomics.

STS.HS.13.1.e Complete applicable safety assessment with 100% accuracy.

STS.HS.13.2 Identify career opportunities in the drafting industry.

STS.HS.13.2.a Identify the various careers, primary duties, and attributes of a drafting technician or a design engineer.

STS.HS.13.2.b Identify the training, education, certification and licensing requirements for various careers of a drafting technician or design engineer.

STS.HS.13.2.c Identify the relationships between stakeholders involved in a manufacturing project.

STS.HS.13.2.d Identify positive work behaviors and personal qualities needed to be employable.

STS.HS.13.2.e Identify high-wage, high-demand, and high-skill drafting careers.

DRAFTING AND DESIGN (cont.)

STS.HS.13.3 Apply math terminology, functions, and formulas to mechanical drafting.

STS.HS.13.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.13.3.b Apply arithmetic operations.

STS.HS.13.3.c Solve decimal/fraction conversions.

STS.HS.13.3.d Explain scale using architect or engineer scales.

STS.HS.13.4 Apply conventional drafting standards used in mechanical drafting.

STS.HS.13.4.a Identify terms and definitions commonly used in the mechanical drafting profession.

STS.HS.13.4.b Employ multiple sketching methods such as oblique, isometric and/or orthographic projection.

STS.HS.13.4.c Apply dimensional information and general notes in mechanical plans.

STS.HS.13.5 Utilize drafting and design technology.

STS.HS.13.5.a Employ the appropriate technology tools (i.e., CAD, SolidWorks, Fusion 360, Inventor, etc.) for conveying information, solving problems, and expediting workplace processes.

STS.HS.13.5.b Employ basic computer and information technology skills used in the drafting industry.

STS.HS.13.5.c Employ ethical digital citizenship.

DRAFTING AND DESIGN (cont.)

STS.HS.13.6 Produce a multiview working drawing.

STS.HS.13.6.a Explain working drawings.

STS.HS.13.6.b Determine types of materials, fasteners, adhesives, and finishes needed to build a product.

STS.HS.13.6.c Produce applicable drawing views, schedules, notes, and index tables.

STS.HS.13.6.d Produce and label section lines.

STS.HS.13.6.e Produce and label detail drawings.

STS.HS.13.6.f Produce dimensions.

MANUFACTURING PROCESSES – WOODS

COURSE DESCRIPTION

In this intermediate class, students will be introduced to the basic manufacturing process in wood. An emphasis will be placed on safe tool and machine usage as well as reading plans and using materials to take a project from conception to reality.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.23.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.23.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.23.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.23.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.23.1.d Employ the safe application of tools and machines.

STS.HS.23.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.23.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.23.2 Identify career opportunities in woodworking areas.

STS.HS.23.2.a Identify responsibilities and characteristics of professionals in a woods industry.

STS.HS.23.2.b Describe work behaviors needed to be employable in a woods industry.

STS.HS.23.2.c Identify the training, education, certification, and licensing requirements for various careers in a woods industry.

STS.HS.23.2.d Identify high wage, high demand, and high skill careers in woodworking.

MANUFACTURING PROCESSES – WOODS (cont.)

STS.HS.23.3 Demonstrate accurate measurements using measurement tools used in woods.

STS.HS.23.3.a Identify types of woods measurement tools.

STS.HS.23.3.b Explain woods measurement tools by use.

STS.HS.23.3.c Demonstrate the accurate use of woods measurement and layout tools to 1/16" precision.

STS.HS.23.4 Solve math functions and formulas to complete woods manufacturing tasks.

STS.HS.23.4.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.23.4.b Apply basic arithmetic operations used in woods manufacturing.

STS.HS.23.4.c Solve decimal/fraction conversions used in woods manufacturing.

STS.HS.23.5 Explain the use of woods manufacturing communications.

STS.HS.23.5.a Define woods manufacturing terminology.

STS.HS.23.5.b Explain the language of wood manufacturing.

STS.HS.23.5.c Explain business and interpersonal communication appropriate to the work in the woods manufacturing environment.

STS.HS.23.6 Determine the materials, tools, machines, and processes required to manufacture a woods product.

STS.HS.23.6.a Identify the characteristics, properties, and origin of diverse woods.

STS.HS.23.6.b Differentiate additive and subtractive woods manufacturing.

STS.HS.23.6.c Identify woods fasteners by their industry standard applications.

STS.HS.23.6.d Determine feed rate and/or speed settings for a wood material and process.

STS.HS.23.6.e Explain the operation and application of common woods industry chemicals.

STS.HS.23.6.f Determine the correct tools, machines, and processes needed to produce a specific wood product.

STS.HS.23.6.g Estimate the amount of materials and supplies needed to manufacture a wood product.

MANUFACTURING PROCESSES – WOODS (cont.)

STS.HS.23.7 Manufacture a product that uses wood as its primary material.

STS.HS.23.7.a Interpret plans, drawings, and specifications to process wood materials.

STS.HS.23.7.b Employ the standard operation and application of tools and machines along the wood manufacturing process.

STS.HS.23.7.c Employ the process of applying the correct types of materials, fasteners, adhesives, and finishes required to manufacture a specific wood product.

STS.HS.23.7.d Critique a finished product.

STS.HS.23.7.e Appraise the manufactured product.

MANUFACTURING PROCESSES – METALS

COURSE DESCRIPTION

In this intermediate class, students will be introduced to the basic manufacturing process in metal. An emphasis will be placed on safe tool and machine usage as well as reading plans and using materials to take a project from conception to reality.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.21.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.21.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.21.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.21.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.21.1.d Employ the safe application of tools and machines.

STS.HS.21.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.21.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.21.2 Identify career opportunities in metals areas.

STS.HS.21.2.a Identify responsibilities and characteristics of professionals in a metals industry.

STS.HS.21.2.b Describe work behaviors needed to be employable in a metals industry.

STS.HS.21.2.c Identify the training, education, certification, and licensing requirements for various careers in a metals industry.

STS.HS.21.2.d Identify high wage, high demand, and high skill careers in metals.

MANUFACTURING PROCESSES – METALS (cont.)

STS.HS.21.3 Demonstrate accurate measurements using measurement tools used in metals.

STS.HS.21.3.a Identify types of metals measurement tools.

STS.HS.21.3.b Explain metals measurement tools by use.

STS.HS.21.3.c Demonstrate the accurate use of metals measurement and layout tools to 1/16" precision.

STS.HS.21.4 Solve math functions and formulas to complete metals manufacturing tasks.

STS.HS.21.4.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.21.4.b Apply basic arithmetic operations used in metals manufacturing.

STS.HS.21.4.c Solve decimal/fraction conversions used in metals manufacturing.

STS.HS.21.5 Analyze the use of metals manufacturing communications.

STS.HS.21.5.a Define metals manufacturing terminology.

STS.HS.21.5.b Interpret the language of metals manufacturing.

STS.HS.21.5.c Explain business and interpersonal communication appropriate to the work in the metals manufacturing environment.

STS.HS.21.6 Determine the materials, tools, machines, and processes required to manufacture a metals product.

STS.HS.21.6.a Identify the characteristics, properties, and origin of diverse metals.

STS.HS.21.6.b Differentiate additive and subtractive metals manufacturing.

STS.HS.21.6.c Identify metals fasteners by their industry standard applications.

STS.HS.21.6.d Determine feed rate and/or speed settings for a metal material and process.

STS.HS.21.6.e Explain the operation and application of common metals industry chemicals.

STS.HS.21.6.f Determine the correct tools, machines, and processes needed to produce a specific metal product.

STS.HS.21.6.g Estimate the amount of materials and supplies needed to manufacture a metal product.

MANUFACTURING PROCESSES – METALS (cont.)

STS.HS.21.7 Manufacture a product that uses metal as its primary material.

STS.HS.23.7.a Interpret plans, drawings, and specifications to process metal materials.

STS.HS.23.7.b Employ the standard operation and application of tools and machines along the metal manufacturing process.

STS.HS.23.7.c Apply the correct types of materials, fasteners, adhesives, and finishes required to manufacture a specific metal product.

STS.HS.23.7.d Explain how to critique a finished product.

STS.HS.23.7.e Explain how to appraise the manufactured product.

MANUFACTURING PROCESSES – PLASTICS

COURSE DESCRIPTION

In this intermediate class, students will be introduced to the basic manufacturing process in plastics. An emphasis will be placed on safe tool and machine usage as well as reading plans and using materials to take a project from conception to reality.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.22.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.22.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.22.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.22.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.22.1.d Employ the safe application of tools and machines.

STS.HS.22.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.22.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.22.2 Identify career opportunities in plastics areas.

STS.HS.22.2.a Identify responsibilities and characteristics of professionals in a plastics industry.

STS.HS.22.2.b Describe work behaviors needed to be employable in a plastics industry.

STS.HS.22.2.c Identify the training, education, certification, and licensing requirements for various careers in a plastics industry.

STS.HS.22.2.d Identify information concerning high wage, high demand, and high skill careers in plastics.

MANUFACTURING PROCESSES – PLASTICS (cont.)

STS.HS.22.3 Demonstrate accurate measurements using measurement tools used in plastics.

STS.HS.22.3.a Identify types of plastics measurement tools.

STS.HS.22.3.b Explain plastics measurement tools by use.

STS.HS.22.3.c Demonstrate the accurate use of plastics measurement and layout tools to 1/16" precision.

STS.HS.22.4 Solve math functions and formulas to complete plastics manufacturing tasks.

STS.HS.22.4.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.22.4.b Apply basic arithmetic operations used in plastics manufacturing.

STS.HS.22.4.c Solve decimal/fraction conversions used in plastics manufacturing.

STS.HS.22.5 Identify the use of plastics manufacturing communications.

STS.HS.22.5.a Define plastics manufacturing terminology.

STS.HS.22.5.b Identify the language of plastics manufacturing.

STS.HS.22.5.c Explain business and interpersonal communication appropriate to the work in the plastics manufacturing environment.

MANUFACTURING PROCESSES – PLASTICS (cont.)

STS.HS.22.6 Determine the materials, tools, machines, and processes required to manufacture a plastics product.

STS.HS.22.6.a Identify the characteristics, properties, and origin of diverse plastics.

STS.HS.22.6.b Differentiate additive and subtractive plastics manufacturing.

STS.HS.22.6.c Identify plastics fasteners by their industry standard applications.

STS.HS.22.6.d Determine feed rate and/or speed settings for a plastic material and process.

STS.HS.22.6.e Explain the operation and application of common plastics industry chemicals.

STS.HS.22.6.f Determine the correct tools, machines, and processes needed to produce a specific plastic product.

STS.HS.22.6.g Estimate the amount of materials and supplies needed to manufacture a plastic product.

STS.HS.22.7 Manufacture a product that uses plastic as its primary material.

STS.HS.23.7.a Interpret plans, drawings, and specifications to process plastic materials.

STS.HS.23.7.b Employ the standard operation and application of tools and machines along the plastic manufacturing process.

STS.HS.23.7.c Apply the correct types of materials, fasteners, adhesives, and finishes required to manufacture a specific plastic product.

STS.HS.23.7.d Critique a finished product.

STS.HS.23.7.e Appraise the manufactured product.

MANUFACTURING PRODUCTION – WOODS

COURSE DESCRIPTION

In the capstone course for the wood manufacturing track, students will utilize tools and equipment to produce parts and projects within specifications. Students will use the knowledge and skills from previous manufacturing courses.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.26.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.26.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.26.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.26.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.

STS.HS.26.1.d Employ the safe application of tools and machines.

STS.HS.26.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.26.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.26.2 Execute accurate measurements using woodworking measurement and layout tools.

STS.HS.26.2.a Identify types of woodworking measurement and layout tools.

STS.HS.26.2.b Categorize woodworking measurement and layout tools by use.

STS.HS.26.2.c Demonstrate the accurate use of measurement and layout tools to 1/16" precision.

MANUFACTURING PRODUCTION – WOODS (cont.)

STS.HS.26.3 Solve math functions and formulas to complete woodworking job/workplace tasks.

STS.HS.26.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.26.3.b Apply basic arithmetic operations.

STS.HS.26.3.c Solve decimal and fraction conversions.

STS.HS.26.4 Identify career opportunities in the wood manufacturing industry.

STS.HS.26.4.a Describe work behaviors needed to be employable.

STS.HS.26.4.b Describe appropriate work behavior that meets or exceeds wood manufacturing industry standards.

STS.HS.26.4.c Identify the education, certification, or licensure required in wood manufacturing careers.

STS.HS.26.4.d Identify the value that may be added to the community by wood manufacturing professionals.

STS.HS.26.4.e Identify the industry standard compensation for a wood manufacturing professional.

STS.HS.26.5 Demonstrate the use of wood manufacturing communications.

STS.HS.26.5.a Define wood manufacturing terminology.

STS.HS.26.5.b Estimate manufacturing timelines based on criteria.

STS.HS.26.5.c Utilize business and interpersonal communication appropriate to the work environment.

MANUFACTURING PRODUCTION – WOODS (cont.)

STS.HS.26.6 Select the materials, tools, machines, and processes required to manufacture a wood product.

STS.HS.26.6.a Identify the origins, characteristics, and properties of softwoods.

STS.HS.26.6.b Identify the origins, characteristics, and properties of hardwoods.

STS.HS.26.6.c Categorize fasteners by their industry standard applications.

STS.HS.26.6.d Differentiate between various types of mechanical and chemical fasteners.

STS.HS.26.6.e Estimate amount of materials and supplies needed for a wood product.

STS.HS.26.6.f Explain the operation and application of common industry finishes.

STS.HS.26.6.g Assess potential environmental and health impacts of using specific materials or processes.

STS.HS.26.6.h Determine the correct tools and machines needed to produce a specific wood product.

STS.HS.26.7 Manufacture a production level product that uses wood as its primary material.

STS.HS.26.7.a Interpret plans, drawings, and specifications to process materials.

STS.HS.26.7.b Coordinate the standard operation and application of tools and machines along the manufacturing process.

STS.HS.26.7.c Plan and apply the type of materials, fasteners, adhesives, and finishes required to manufacture a specific product.

STS.HS.26.7.d Critique a finished product.

STS.HS.26.7.e Appraise the manufacturing process for streamlining opportunities.

MANUFACTURING PRODUCTION – METALS

COURSE DESCRIPTION

In the capstone course for the metal manufacturing track, students will utilize tools and equipment to produce parts and projects within specifications. Students will use knowledge and skills from previous manufacturing courses.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.24.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.24.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.24.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.24.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.

STS.HS.24.1.d Employ the safe application of tools and machines.

STS.HS.24.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.24.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.24.2 Execute accurate measurements using metals measurement and layout tools.

STS.HS.24.2.a Identify types of metals measurement and layout tools.

STS.HS.24.2.b Categorize metals measurement and layout tools by use.

STS.HS.24.2.c Demonstrate the accurate use of measurement and layout tools to 0.010" or 0.001" precision or 1mm precision.

MANUFACTURING PRODUCTION – METALS (cont.)

STS.HS.24.3 Solve math functions and formulas to complete metals job/workplace tasks.

STS.HS.24.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.24.3.b Apply basic arithmetic operations.

STS.HS.24.3.c Solve decimal and fraction conversions.

STS.HS.24.4 Identify career opportunities in the metals manufacturing industry.

STS.HS.24.4.a Describe work behaviors needed to be employable.

STS.HS.24.4.b Describe appropriate work behavior that meets or exceeds metals manufacturing industry standards.

STS.HS.24.4.c Identify the education, certification, or licensure required in metals manufacturing careers.

STS.HS.24.4.d Identify the value that may be added to the community by metals manufacturing professionals.

STS.HS.24.4.e Identify the industry standard compensation for a metals manufacturing professional.

STS.HS.23.5 Demonstrate use of metal manufacturing communications.

STS.HS.24.5.a Define metal manufacturing terminology.

STS.HS.24.5.b Estimate metal manufacturing timelines based on criteria.

STS.HS.24.5.c Demonstrate business and interpersonal communication appropriate to the work environment.

MANUFACTURING PRODUCTION – METALS (cont.)

STS.HS.24.6 Describe the materials, tools, machines, and processes required to manufacture a metal product.

STS.HS.24.6.a Identify the characteristics, properties, and origin of diverse metals.

STS.HS.24.6.b Differentiate between additive and subtractive manufacturing.

STS.HS.24.6.c Categorize fasteners by their industry standard applications.

STS.HS.24.6.d Differentiate between various types of mechanical fasteners.

STS.HS.24.6.e Determine feed rate and speed settings for a material and process.

STS.HS.24.6.f Explain the operation and application of common industry chemicals.

STS.HS.24.6.g Assess potential environmental and health impacts of using specific materials and/or processes.

STS.HS.24.6.h Estimate amount of materials and supplies needed for a product.

STS.HS.24.6.i Determine the correct tools, machines and processes needed to produce a specific metal product.

STS.HS.24.7 Produce a production-level metalworking project.

STS.HS.24.7.a Interpret plans, drawings, and specifications to process materials.

STS.HS.24.7.b Coordinate the standard operation and application of tools and machines along the manufacturing process.

STS.HS.24.7.c Apply the type of materials, processes, and finishes required to manufacture a specific metal product.

STS.HS.24.7.d Critique a finished product.

STS.HS.24.7.e Appraise the manufacturing process for streamlining opportunities.

MANUFACTURING PRODUCTION – PLASTICS

COURSE DESCRIPTION

In the capstone course for the plastic manufacturing track, students will utilize tools and equipment to produce parts and projects within specifications. Students will use the knowledge and skills from previous manufacturing courses.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.25.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.25.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.25.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.25.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.

STS.HS.25.1.d Employ the safe application of tools and machines.

STS.HS.25.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.25.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.25.2 Execute accurate measurements using plastics measurement and layout tools.

STS.HS.25.2.a Identify types of plastics measurement and layout tools.

STS.HS.25.2.b Categorize plastics measurement and layout tools by use.

STS.HS.25.2.c Demonstrate the accurate use of measurement and layout tools to 1/16" precision.

MANUFACTURING PRODUCTION – PLASTICS (cont.)

STS.HS.25.3 Solve math functions and formulas to complete plastics job/workplace tasks.

STS.HS.25.3.a Identify whole numbers, decimals, fractions, and complex numbers used in the workplace.

STS.HS.25.3.b Apply basic arithmetic operations used in the workplace.

STS.HS.25.3.c Solve decimal and fraction conversions used in the workplace.

STS.HS.25.4 Identify career opportunities in the plastics manufacturing industry.

STS.HS.25.4.a Describe work behaviors needed to be employable.

STS.HS.25.4.b Describe appropriate work behavior that meets or exceeds plastics manufacturing industry standards.

STS.HS.25.4.c dentify the education, certification, or licensure required in plastics manufacturing careers.

STS.HS.25.4.d Identify the value that may be added to the community by plastics manufacturing professionals.

STS.HS.25.4.e Identify the industry standard compensation for a plastics manufacturing professional.

STS.HS.25.5 Demonstrate the use of plastic manufacturing communications.

STS.HS.25.5.a Define plastic manufacturing terminology.

STS.HS.25.5.b Estimate manufacturing timelines based on criteria.

STS.HS.25.5.c Utilize business and interpersonal communication appropriate to the plastics manufacturing work environment.

STS.HS.25.4.d Identify the industry standard compensation for a plastics manufacturing professional.

MANUFACTURING PRODUCTION – PLASTICS (cont.)

STS.HS.25.6 Select the materials, tools, machines, and processes required to manufacture a plastic product.

STS.HS.25.6.a Identify the origins, characteristics, and properties of various types of plastics.

STS.HS.25.6.b Categorize fasteners by their industry standard applications.

STS.HS.25.6.c Differentiate between various types of mechanical and chemical fasteners.

STS.HS.25.6.d Estimate amount of materials and supplies needed for a plastic product.

STS.HS.25.6.e Explain the operation and application of common industry finishes.

STS.HS.25.6.f Assess potential environmental and health impacts of using specific materials or processes.

STS.HS.25.6.g Determine the correct tools and machines needed to produce a specific plastic product.

STS.HS.25.7 Manufacture a production level product that uses plastic as its primary material.

STS.HS.25.7.a Interpret plans, drawings, and specifications to process materials.

STS.HS.25.7.b Coordinate the standard operation and application of tools and machines along the manufacturing process.

STS.HS.25.7.c Plan and apply the type of materials, fasteners, adhesives, and finishes required to manufacture a specific product.

STS.HS.25.7.d Critique a finished product.

STS.HS.25.7.e Appraise the manufacturing process for streamlining opportunities.

INTRODUCTION TO MECHATRONICS

COURSE DESCRIPTION

Mechatronics combines the industrial skills of mechanics, electronics, hydraulics, and computer-based controls.

Target Grades: 11-12.

STANDARDS AND INDICATORS:

STS.HS.19.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.19.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.19.1.b Employ eye protection in compliance with Neb. Rev. Statute 79–715.
- STS.HS.19.1.c Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.19.1.d Employ the safe application of tools and machines.
- STS.HS.19.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.19.1.f Demonstrate proper handling and storing of materials.

STS.HS.19.2 Identify career opportunities in mechatronics.

- STS.HS.19.2.a Describe work behaviors needed to be employable.
- STS.HS.19.2.b Identify employment trends in mechatronics.
- STS.HS.19.2.c Identify the responsibilities and characteristics of professionals in mechatronics.
- STS.HS.19.2.d Identify the training, education, certification, and licensing requirements for careers in mechatronics.

INTRODUCTION TO MECHATRONICS (cont.)

STS.HS.19.3 Solve math functions and formulas to complete mechatronics job or workplace tasks.

STS.HS.19.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.19.3.b Apply basic algebraic operations.

STS.HS.19.3.c Interpret scientific notation.

STS.HS.19.3.d Interpret engineering notation.

STS.HS.19.4 Explain mechatronics systems.

STS.HS.19.4.a Explain the theory and applications of hydraulics.

STS.HS.19.4.b Explain the theory and application of electronics.

STS.HS.19.4.c Explain the theory and application of pneumatics.

STS.HS.19.4.d Explain the theory and applications of control systems.

STS.HS.19.4.e Explain the theory and applications of computer systems.

STS.HS.19.5 Demonstrate use of mechatronics communications.

STS.HS.19.5.a Define mechatronics terminology.

STS.HS.19.5.b Interpret the language of mechatronics.

STS.HS.19.5.c Interpret electrical schematics, spec sheets, mechanical drawings, and hydraulic circuit diagrams.

STS.HS.19.5.d Employ business and interpersonal communication appropriate to the work environment.

INTRODUCTION TO MECHATRONICS (cont.)

STS.HS.19.6 Construct a mechatronic device based upon given specifications.

STS.HS.19.6.a Employ measurement tools.

STS.HS.19.6.b Select fasteners to mount components.

STS.HS.19.6.c Employ appropriate wires or tubing to make correct electrical, hydraulic, or pneumatic connections.

STS.HS.19.6.d Employ best practices in laying out wires and tubes for neatness, security, and safe operation.

STS.HS.19.6.e Adjust and calibrate subsystems by using interdisciplinary skills.

STS.HS.19.6.f Explain construction, electrical, and mechanical blueprints.

STS.HS.19.7 Integrate instrumentation to identify and troubleshoot problems in a mechatronics system.

STS.HS.19.7.a Employ meters to test resistance, voltage, and current to assess electrical equipment.

STS.HS.19.7.b Perform precision measuring on mechanical, hydraulic, electronic, or pneumatic components.

STS.HS.19.7.c Utilize data gained from instrumentation to develop troubleshooting options.

ADVANCED ELECTRONICS

COURSE DESCRIPTION

This capstone course focuses on circuitry diagnostics and the application and design of circuits using the principles of analog and digital electronics. Students will learn safe practices with electronics and the importance of electronics in industry and society.

Target Grades: 11-12.

STANDARDS AND INDICATORS:

STS.HS.1.1 Apply safety principles, practices, philosophy and guidelines to the work environment.

- STS.HS.1.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.1.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.1.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.
- STS.HS.1.1.d Carry out the safe application of tools and machines.
- STS.HS.1.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.1.1.f Demonstrate proper handling and storing of materials.

STS.HS.1.2 Investigate career opportunities in the electronics industry.

- STS.HS.1.2.a Identify responsibilities and characteristics of professionals in industry.
- STS.HS.1.2.b Describe work behaviors needed to be employable.
- STS.HS.1.2.c Identify the training, education, certification, and licensing requirements for various careers in the electronics industry.
- STS.HS.1.2.d Identify high-wage, high-demand, and high-skill electronics careers.

ADVANCED ELECTRONICS (cont.)

STS.HS.1.3 Employ electronic terminology, symbols, laws, and equipment.

STS.HS.1.3.a Identify proper electronic terminology and symbols.

STS.HS.1.3.b Compute and manipulate the Laws of Electronics (i.e., Ohms, Watts, Kirchhoff's).

STS.HS.1.3.c Identify and operate all basic electronic equipment.

STS.HS.1.4 Construct electronic circuits.

STS.HS.1.4.a Interpret, design, and synthesize electronic circuits.

STS.HS.1.4.b Explain the characteristics of AC Electricity and its components.

STS.HS.1.4.c Explain basic solid state fundamentals.

STS.HS.1.4.d Explain logic gate circuits.

STS.HS.1.4.e Troubleshoot and analyze electronic circuits.

ADVANCED MANUFACTURING & FABRICATION – WOODS

COURSE DESCRIPTION

This expanded learning course allows students to go beyond the woods manufacturing program of study. Students will use the most advanced equipment, including CNC, to produce projects exceeding industry standards.

Target Grades: 11-12.

STANDARDS AND INDICATORS:

STS.HS.4.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.4.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.4.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.4.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.
- STS.HS.4.1.d Employ the safe application of tools and machines.
- STS.HS.4.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.4.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.4.2 Execute accurate measurements using precision wood measurement tools.

- STS.HS.4.2.a Identify types of precision measurement tools.
- STS.HS.4.2.b Categorize precision measurement tools by use.
- STS.HS.4.2.c Differentiate between measurement tools and layout tools.
- STS.HS.4.2.d Demonstrate the accurate use of measurement and layout tools to 1/64" precision.
- STS.HS.4.2.e Demonstrate the accurate use of measurement and layout tools to 0.5mm precision.

ADVANCED MANUFACTURING - WOODS (cont.)

STS.HS.4.3 Solve math functions and formulas to complete woodworking job or workplace tasks.

STS.HS.4.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.4.3.b Apply intermediate arithmetic operations.

STS.HS.4.3.c Apply basic geometric operations.

STS.HS.4.3.d Solve decimal or fraction conversions.

STS.HS.4.3.e Solve metric or United States Customary System (USCS) conversions.

STS.HS.4.4 Identify career opportunities in the wood manufacturing industry.

STS.HS.4.4.a Describe work behaviors needed to be employable.

STS.HS.4.4.b Employ appropriate work behavior that meets or exceeds wood industry standards.

STS.HS.4.4.c Explain the required education, certification, or licensure needed for a wood manufacturing career.

STS.HS.4.4.d Analyze the value that may be added to the community by manufacturing professionals.

STS.HS.4.4.e Explain the industry standard compensation for a wood manufacturing professional.

STS.HS.4.5 Apply manufacturing communications.

STS.HS.4.5.a Define wood manufacturing terminology.

STS.HS.4.5.b Generate a wood project proposal.

STS.HS.4.5.c Estimate manufacturing timelines based on criteria.

STS.HS.4.5.d Utilize business and interpersonal communication appropriate to the work environment.

ADVANCED MANUFACTURING - WOODS (cont.)

STS.HS.4.6 Assess the materials, tools, machines, and processes required to manufacture a wood product.

STS.HS.4.6.a Identify the characteristics, properties, and origin of softwoods.

STS.HS.4.6.b Identify the characteristics, properties, and origin of hardwoods.

STS.HS.4.6.c Differentiate additive and subtractive manufacturing.

STS.HS.4.6.d Identify fasteners by their industry standard applications.

STS.HS.4.6.e Differentiate between various types of mechanical and chemical fasteners.

STS.HS.4.6.f Estimate amount of materials and supplies needed for a product.

STS.HS.4.6.g Determine feed rate and speed settings for a material and process.

STS.HS.4.6.h Explain the operation and application of common wood industry finishes.

STS.HS.4.6.i Assess potential environmental and health impacts of using specific materials or processes.

STS.HS.4.6.j Determine the correct tools, machines, and processes needed to produce a specific wood product.

STS.HS.4.7 Manufacture a custom-level product that uses wood as its primary material.

STS.HS.4.7.a Interpret plans, drawings, and specifications to process materials.

STS.HS.4.7.b Coordinate the standard operation and application of tools and machines along the manufacturing process.

STS.HS.4.7.c Plan and apply the type of materials, processes, and finishes required to manufacture a specific product.

STS.HS.4.7.d Critique a finished product.

STS.HS.4.7.e Appraise the manufacturing process for streamlining opportunities.

ADVANCED MANUFACTURING & FABRICATION – METALS

COURSE DESCRIPTION

This expanded learning course allows students to go beyond the metals manufacturing program of study. Students will use the most advanced equipment, including CNC, to produce projects exceeding industry standards.

Target Grades: 11-12.

STANDARDS AND INDICATORS:

STS.HS.2.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.2.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.2.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.2.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.
- STS.HS.2.1.d Employ the safe application of tools and machines.
- STS.HS.2.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.2.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.2.2 Execute accurate measurements using precision metal measurement tools.

- STS.HS.2.2.a Identify types of precision measurement tools.
- STS.HS.2.2.b Categorize precision measurement tools by use.
- STS.HS.2.2.c Differentiate between measurement tools and layout tools.
- STS.HS.2.2.d Demonstrate the accurate use of measurement and layout tools to 1/64" precision or 0.5mm precision.

ADVANCED MANUFACTURING - METALS (cont.)

STS.HS.2.3 Solve math functions and formulas to complete metals job or workplace tasks.

STS.HS.2.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.2.3.b Apply intermediate arithmetic operations.

STS.HS.2.3.c Apply basic geometric operations.

STS.HS.2.3.d Solve decimal or fraction conversions.

STS.HS.2.3.d Solve metric or United States Customary System (USCS) conversions.

STS.HS.2.4 Identify career opportunities in the metal manufacturing industry.

STS.HS.2.4.a Describe work behaviors needed to be employable.

STS.HS.2.4.b Employ appropriate work behavior that meets or exceeds metal industry standards.

STS.HS.2.4.d Explain the required education, certification, or licensure needed for a metal manufacturing career.

STS.HS.2.4.e Analyze the value that may be added to the community by manufacturing professionals.

STS.HS.2.4.f Explain the industry standard compensation for a metal manufacturing professional.

STS.HS.2.5 Apply manufacturing communications.

STS.HS.2.5.a Define metal manufacturing terminology.

STS.HS.2.5.b Generate a metal project proposal.

STS.HS.2.5.c Estimate manufacturing timelines based on criteria.

STS.HS.2.5.d Utilize business and interpersonal communication appropriate to the work environment.

ADVANCED MANUFACTURING - METALS (cont.)

STS.HS.2.6 Describe the materials, tools, machines, and processes required to manufacture a metal product.

STS.HS.2.6.a Identify the various types of metals and their characteristics.

STS.HS.2.6.b Differentiate additive and subtractive manufacturing.

STS.HS.2.6.c Identify fasteners by their industry standard applications.

STS.HS.2.6.d Differentiate between various types of mechanical and chemical fasteners.

STS.HS.2.6.e Estimate amount of materials and supplies needed for a product.

STS.HS.2.6.f Determine feed rate and speed settings for a material and process.

STS.HS.2.6.g Explain the operation and application of common metal industry finishes.

STS.HS.2.6.h Assess potential environmental and health impacts of using specific materials or processes.

STS.HS.2.6.i Determine the correct tools, machines, and processes needed to produce a specific metal product.

STS.HS.2.7 Manufacture a custom-level product that uses metal as its primary material.

STS.HS.2.7.a Interpret plans, drawings, and specifications to process materials.

STS.HS.2.7.b Coordinate the standard operation and application of tools and machines along the manufacturing process.

STS.HS.2.7.c Plan and apply the type of materials, processes, and finishes required to manufacture a specific product.

STS.HS.2.7.d Critique a finished product.

STS.HS.2.7.e Appraise the manufacturing process for streamlining opportunities.

ADVANCED MANUFACTURING & FABRICATION – PLASTICS

COURSE DESCRIPTION

This expanded learning course allows students to go beyond the plastics manufacturing program of study. Students will use the most advanced equipment, including CNC, to produce projects exceeding industry standards.

Target Grades: 11-12.

STANDARDS AND INDICATORS:

STS.HS.3.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

- STS.HS.3.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.3.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.
- STS.HS.3.1.c Employ eye protection in compliance with Neb. Rev. Statute 79–715.
- STS.HS.3.1.d Employ the safe application of tools and machines.
- STS.HS.3.1.e Explain the main hazards that are possible in the lab setting.
- STS.HS.3.1.f Demonstrate proper handling and storing of materials and chemicals.

STS.HS.3.2 Execute accurate measurements using precision plastic measurement tools.

- STS.HS.3.2.a Identify types of precision measurement tools.
- STS.HS.3.2.b Categorize precision measurement tools by use.
- STS.HS.3.2.c Differentiate between measurement tools and layout tools.
- STS.HS.3.2.d Demonstrate the accurate use of measurement and layout tools to 1/64" precision or 0.5mm precision.

ADVANCED MANUFACTURING - PLASTICS (cont.)

STS.HS.3.3 Solve math functions and formulas to complete plastics job or workplace tasks.

STS.HS.3.3.a Identify whole numbers, decimals, fractions, and complex numbers.

STS.HS.3.3.b Apply intermediate arithmetic operations.

STS.HS.3.3.c Apply basic geometric operations.

STS.HS.3.3.d Solve decimal or fraction conversions.

STS.HS.3.3.e Solve metric or United States Customary System (USCS) conversions.

STS.HS.3.4 Identify career opportunities in the plastics manufacturing industry.

STS.HS.3.4.a Describe work behaviors needed to be employable.

STS.HS.3.4.b Employ appropriate work behavior that meets or exceeds plastics industry standards.

STS.HS.3.4.c Explain the required education, certification, or licensure needed for a plastics manufacturing career.

STS.HS.3.4.d Analyze the value that may be added to the community by manufacturing professionals.

STS.HS.3.4.e Explain the industry standard compensation for a plastics manufacturing professional.

STS.HS.3.5 Apply manufacturing communications.

STS.HS.3.5.a Define plastic manufacturing terminology.

STS.HS.3.5.b Generate a plastic project proposal.

STS.HS.3.5.c Estimate manufacturing timelines based on criteria.

STS.HS.3.5.d Utilize business and interpersonal communication appropriate to the work environment.

ADVANCED MANUFACTURING - PLASTICS (cont.)

STS.HS.3.6 Describe the materials, tools, machines, and processes required to manufacture a plastic product.

STS.HS.3.6.a Identify the various types of plastics and their characteristics.

STS.HS.3.6.b Differentiate additive and subtractive manufacturing.

STS.HS.3.6.c Identify fasteners by their industry standard applications.

STS.HS.3.6.d Differentiate between various types of mechanical and chemical fasteners.

STS.HS.3.6.e Estimate amount of materials and supplies needed for a product.

STS.HS.3.6.f Determine feed rate and speed settings for a material and process.

STS.HS.3.6.g Explain the operation and application of common plastic industry finishes.

STS.HS.3.6.h Assess potential environmental and health impacts of using specific materials or processes.

STS.HS.3.6.i Determine the correct tools, machines, and processes needed to produce a specific plastic product.

STS.HS.3.7 Manufacture a custom-level product that uses plastic as its primary material.

STS.HS.3.7.a Interpret plans, drawings, and specifications to process materials.

STS.HS.3.7.b Coordinate the standard operation and application of tools and machines along the manufacturing process.

STS.HS.3.7.c Plan and apply the type of materials, processes, and finishes required to manufacture a specific product.

STS.HS.3.7.d Critique a finished product.

STS.HS.3.7.e Appraise the manufacturing process for streamlining opportunities.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES

COURSE DESCRIPTION

This introductory course provides the skills and technical knowledge for a beginning student in areas of industry, safety, material, equipment, and process understanding. This entry level course helps students gain a foundation in all areas of Skilled and Technical Sciences including Architecture and Construction; Energy and Engineering; Manufacturing; and Transportation, Distribution, and Logistics.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.20.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.20.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.20.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.20.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.20.1.d Employ the safe application of tools and machines.

STS.HS.20.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.20.1.f Demonstrate proper handling and storing of materials.

STS.HS.20.2 Identify career opportunities in Skilled and Technical Sciences areas.

STS.HS.20.2.a Identify responsibilities and characteristics of professionals in a skilled and technical sciences industry.

STS.HS.20.2.b Describe work behaviors needed to be employable in a skilled and technical sciences industry.

STS.HS.20.2.c Identify the training, education, certification, and licensing requirements for various careers in a skilled and technical sciences industry.

STS.HS.20.2.d Identify high wage, high demand, and high skill careers in skilled and technical sciences.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES (cont.)

STS.HS.20.3 Apply appropriate academic and technical skills to produce a product.

STS.HS.20.3.a Employ project-related math operations and formulas.

STS.HS.20.3.b Employ effective verbal, written, and/or visual communication skills.

STS.HS.20.3.c Define course content vocabulary.

STS.HS.20.3.d Conduct the accurate use of measurement tools

STS.HS.20.4 Identify the materials, tools, machines, and equipment required to produce a product.

STS.HS.20.4.a Identify types of materials to be used for various products.

STS.HS.20.4.b Identify types of fasteners for various products.

STS.HS.20.4.c Identify types of adhesives for various products.

STS.HS.20.4.d Identify types of finishes for various products.

STS.HS.20.4.e Identify the correct tools, machines, and equipment appropriate for a specific operation or process.

STS.HS.20.5 Produce a product(s).

STS.HS.20.5.a Interpret working drawings of a product to be produced.

STS.HS.20.5.b Select the proper materials adhesives, fasteners and finishes for a product.

STS.HS.20.5.c Demonstrate the proper tool, machine, or equipment selection and usage for each corresponding operation needed to produce a product.

STS.HS.20.5.d Execute a plan of procedure.

WELDING 1

COURSE DESCRIPTION

This course introduces students to arc welding and cutting processes. Emphasis is placed on welding safety, basic welding procedures, and career opportunities in welding. Students will have an opportunity to learn and practice various welding positions. Production of a small product will be incorporated.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.35.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.35.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.35.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.35.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.35.1.d Employ the safe application of tools and machines.

STS.HS.35.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.35.1.f Demonstrate proper handling and storing of materials.

STS.HS.35.2 Explain career opportunities in the welding industry.

STS.HS.35.2.a Describe work behaviors needed to be employable.

STS.HS.35.2.b Identify employment trends in the welding industry.

STS.HS.35.2.c Identify the responsibilities and characteristics of professionals in the welding industry.

STS.HS.35.2.d Identify the training, education, certification and licensing requirements for careers in the welding industry.

WELDING 1 (cont.)

STS.HS.35.3 Explain the use of welding communications.

STS.HS.35.3.a Define welding terminology.

STS.HS.35.3.b Measure metric and imperial measurements with an accuracy of a millimeter or 1/16 of an inch.

STS.HS.35.3.c Explain mechanical drawings according to the American National Standards Institute (ANSI).

STS.HS.35.3.d Explain welding symbols according to the AWS.

STS.HS.35.3.e Explain information from a welding procedure sheet.

STS.HS.35.4 Determine the materials, tools, and equipment needed to weld.

STS.HS.35.4.a Identify tools and their use in welding.

STS.HS.35.4.b Identify welding equipment and proper set up procedures according to the manufacturer's recommendations.

STS.HS.35.4.c Identify the material used in welding.

STS.HS.35.4.d Identify the filler material used in welding.

STS.HS.35.4.e Determine types of fasteners, adhesives, and finishes used for welding.

STS.HS.35.5 Perform metal cutting operations.

STS.HS.35.5.a Perform an abrasive cutting procedure.

STS.HS.35.5.b Perform mechanical cutting procedure.

STS.HS.35.5.c Perform a hot (flame) source cutting operation.

STS.HS.35.5.d Perform an arc cutting operation.

WELDING 1 (cont.)

STS.HS.35.6 Join material using any methods of welding procedure in the flat and horizontal positions.

STS.HS.35.6.a Create a pad of surface welds with no welding defects according to AWS standards.

STS.HS.35.6.b Create groove joints with no welding defects according to AWS standards.

STS.HS.35.6.c Create fillet welds with no welding defects according to AWS standards.

STS.HS.35.6.d Produce a product with the welding processes that are available.

WELDING 2

COURSE DESCRIPTION

This capstone course is a continuation of learning the knowledge and skills of the welding industry. Students will learn welding safety, communications, material and tool usage, and welding positions. Students will apply this knowledge and skill to produce a product.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.36.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.36.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.36.1.b Use appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.36.1.c Use eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.36.1.d Carry out the safe application of tools and machines.

STS.HS.36.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.36.1.f Demonstrate proper handling and storing of materials.

STS.HS.36.2 Investigate career opportunities in the welding industry.

STS.HS.36.2.a Describe work behaviors needed to be employable.

STS.HS.36.2.b Identify employment trends in the welding industry.

STS.HS.36.2.c Identify the responsibilities and characteristics of professionals in the welding industry.

STS.HS.36.2.d Identify the training, education, certification and licensing requirements for careers in the welding industry.

WELDING 2 (cont.)

STS.HS.36.3 Demonstrate the use of welding communications.

STS.HS.36.3.a Explain welding terminology.

STS.HS.36.3.b Describe a quality weld according to the American Welding Society (AWS).

STS.HS.36.3.c Measure metric and imperial measurements within an accuracy of a millimeter or 1/32 of an inch.

STS.HS.36.3.d Explain mechanical drawings according to the American National Standards Institute (ANSI).

STS.HS.36.3.e Explain welding symbols according to the AWS.

STS.HS.36.3.f Solve mathematical functions used in welding.

STS.HS.36.3.g Interpret information from a welding procedure sheet.

STS.HS.36.4 Identify the materials, tools, and equipment needed to weld.

STS.HS.36.4.a Identify tools and their use in welding.

STS.HS.36.4.b Identify welding equipment and proper set up procedures according to the manufacturers' recommendations.

STS.HS.36.4.c Identify the material used in welding.

STS.HS.36.4.d Identify the filler material used in welding.

STS.HS.36.4.e Identify types of fasteners, adhesives, and finishes used for welding.

WELDING 2 (cont.)

STS.HS.36.5 Perform metal cutting operations.

STS.HS.36.5.a Perform an abrasive cutting procedure.

STS.HS.36.5.b Perform a mechanical cutting procedure.

STS.HS.36.5.c Perform a hot (flame) source cutting operation.

STS.HS.36.5.d Perform an arc cutting operation.

STS.HS.36.5.e Perform an automated cutting operation.

STS.HS.36.6 Perform welding procedures in the flat, horizontal, and vertical positions.

STS.HS.36.6.a Create a pad of surface welds with no welding defects according to the AWS.

STS.HS.36.6.b Create groove joints with no welding defects according to AWS standards.

STS.HS.36.6.c Create fillet welds with no welding defects according to AWS standards.

STS.HS.36.7 Produce a product with welding processes.

STS.HS.36.7.a Use a drawing with welding symbols according to AWS.

STS.HS.36.7.b Cut the materials according to the technical drawing.

STS.HS.36.7.c Weld the materials according to the technical drawing.

STS.HS.36.7.d Finish the materials according to the technical drawing.

WELDING 3

COURSE DESCRIPTION

This is a project-oriented extended learning course that is designed to prepare a student for postsecondary and/or entry into industry. An emphasis on safety and welding operations will be covered. This course will assist the student going into a welding career.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.37.1 Apply safety principles, practices, philosophy and guidelines to the work environment.

STS.HS.37.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.37.1.b Use appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.37.1.c Use eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.37.1.d Carry out the safe application of tools and machines.

STS.HS.37.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.37.1.f Demonstrate proper handling and storing of materials.

STS.HS.37.2 Identify career opportunities in the welding industry.

STS.HS.37.2.a Describe work behaviors needed to be employable.

STS.HS.37.2.b Identify employment trends in the welding industry.

STS.HS.37.2.c Identify the responsibilities and characteristics of professionals in the welding industry.

STS.HS.37.2.d Identify the training, education, certification, and licensing requirements for careers in the welding industry.

WELDING 3 (cont.)

STS.HS.37.3 Demonstrate the use of welding communications.

STS.HS.37.3.a Explain welding terminology.

STS.HS.37.3.b Identify a quality weld according to the American Welding Society (AWS).

STS.HS.37.3.c Measure metric and imperial measurements within an accuracy of a millimeter or 1/64 of an inch.

STS.HS.37.3.d Explain mechanical drawings according to the American National Standards Institute (ANSI).

STS.HS.37.3.e Explain welding symbols according to the AWS.

STS.HS.37.3.f Solve mathematical functions used in welding.

STS.HS.37.3.g Explain information from a welding procedure sheet.

STS.HS.37.4 Identify the materials, tools, fasteners, and equipment needed to weld.

STS.HS.37.4.a Identify tools and their use in welding.

STS.HS.37.4.b Identify welding equipment and proper set up procedures according to the manufacturer's recommendations.

STS.HS.37.4.c Identify the material used in welding.

STS.HS.37.4.d Identify the filler material used in welding.

STS.HS.37.4.e Determine types of fasteners, adhesives, and finishes used for welding.

STS.HS.37.4.f Identify automated or emerging technologies in welding.

WELDING 3 (cont.)

STS.HS.37.5 Perform metal cutting operations.

STS.HS.37.5.a Perform an abrasive cutting procedure.

STS.HS.37.5.b Perform a mechanical cutting procedure.

STS.HS.37.5.c Perform a hot (flame) source cutting operation.

STS.HS.37.5.d Perform an arc cutting operation.

STS.HS.37.5.e Perform an automated cutting operation.

STS.HS.37.6 Join material using any methods of welding procedure in the flat, horizontal, vertical, and overhead positions.

STS.HS.37.6.a Create a pad of surface welds with no welding defects according to the AWS.

STS.HS.37.6.b Create groove joints with no welding defects according to AWS standards.

STS.HS.37.6.c Create fillet welds with no welding defects according to AWS standards.

STS.HS.37.6.d Perform an AWS standard bend test.

STS.HS.37.7 Produce a product with welding processes that are available.

STS.HS.37.7.a Create a drawing with welding symbols according to AWS.

STS.HS.37.7.b Perform mathematical calculations to estimate the cost of materials for the product.

STS.HS.37.7.c Produce and finish the product to specifications.

INTRODUCTION TO TRANSPORTATION, DISTRIBUTION, AND LOGISTICS

COURSE DESCRIPTION

This course will introduce students to the basics of transportation, distribution, and logistics (TDL). Students will learn how the supply chain of products and materials operate to keep industry running and consumer products available.

Target Grades 9-11.

STANDARDS AND INDICATORS:

STS.HS.37.1 Apply safety principles, practices, philosophy and guidelines to the work environment.

STS.HS.37.1.a Complete safety assessments with 100% accuracy.

STS.HS.37.1.b Employ the requirements of safety glasses and other personal protective equipment (PPE).

STS.HS.37.1.c Employ the safe use of tools, machines, and equipment in alignment with industry standards to maintain a safe workplace.

STS.HS.37.1.d Describe the role of government agencies in providing a safe workplace.

STS.HS.37.2 Identify career opportunities in the transportation, distribution, and logistics (TDL) industry.

STS.HS.37.2.a Identify the responsibilities and characteristics of professionals in the TDL industry.

STS.HS.37.2.b Identify employment trends in the TDL industry.

STS.HS.37.2.c Identify the training, education, certification, and licensing requirements for various careers in the TDL industry.

INTRODUCTION TO TRANSPORTATION, DISTRIBUTION, AND LOGISTICS (cont.)

STS.HS.37.3 Analyze the segments and functions of the TDL industry.

STS.HS.37.a Describe the five modes of transportation used to distribute people and products.

STS.HS.37.b Compare different cargo types and the modes of transportation typically used for each.

STS.HS.37.c Identify the individual systems that combine to create the TDL industry.

STS.HS.37.d Explain how the individual systems that combine to create the TDL industry function together.

STS.HS.37.4 Explain the purpose and components of transportation logistics.

STS.HS.37.4.a Explain dispatch and the purpose of tracking products as they are transported throughout the supply chain.

STS.HS.37.4.b Describe the components that impact transportation logistics (i.e., routing, scheduling, equipment, operator, etc.).

STS.HS.37.4.c Explain the different types of shipping documentation and terms.

STS.HS.37.4.d Describe strategic, tactical, and systems planning.

DISTRIBUTION AND LOGISTICS

COURSE DESCRIPTION

This intermediate course is a study of the acquisition, storage, use, packaging, transportation, and distribution of materials and products. It showcases all of the steps necessary to take raw materials and produce a product.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.12.1 Explain career opportunities in the transportation industry.

STS.HS.12.1.a	Identify the responsibilities and characteristics of professionals in the transportation industry.
STS.HS.12.1.b	Identify employment trends in the transportation industry.
STS.HS.12.1.c	Identify high-wage, high-demand, and high-skill careers in the transportation, distribution, and Logistics (TDL) industry.
STS.HS.12.1.d	Identify work behaviors needed to be employable.
STS.HS.12.1.e	Identify the training, education, certification, and licensing requirements for various careers in TDL.

STS.HS.12.2 Explain the segments and functions of the TDL industry.

STS.HS.12.2.a	Explain order processing, receiving, storage, retrieval, packaging, and shipping of a product in the global supply chain logistics life cycle.
STS.HS.12.2.b	Identify the role of product receiving in the global supply chain logistics life cycle.
STS.HS.12.2.c	Identify the role of product storage and retrieval in the global supply chain logistics life cycle.
STS.HS.12.2.d	Identify the role of order processing in the global supply chain logistics life cycle.
STS.HS.12.2.e	Explain inventory control principles.
STS.HS.12.2.f	Explain distribution and distributorships.

DISTRIBUTION AND LOGISTICS (cont.)

STS.HS.12.3 Explain the purpose and components of transportation logistics.

STS.HS.12.3.a Explain dispatch and the purpose of tracking of products as they are transported throughout the supply chain.

STS.HS.12.3.b Describe the components that impact transportation logistics (i.e. routing, scheduling, equipment, operator, etc.).

STS.HS.12.3.c Explain the different types of shipping documentation and terms.

STS.HS.12.3.d Describe strategic, tactical, and systems planning.

BUSINESS LOGISTICS

COURSE DESCRIPTION

This capstone course is an in-depth study of the logistics of a business operation as it relates to transportation and distribution. Students will learn about order processing, receiving, storage, retrieval, packaging, and shipping of materials and products.

Target Grades 11-12.

STANDARDS AND INDICATORS:

STS.HS.8.1 Identify career opportunities in the transportation, distribution, and logistics (TDL) industry.

STS.HS.8.1.a Identify the most common TDL careers and related fields of employment.

STS.HS.8.1.b Identify the traits and skills employers look for in their employees.

STS.HS.8.1.c Identify the training, education, certification, and licensing requirements for various careers in the TDL industry.

STS.HS.8.2 Identify the segments and functions of the TDL industry.

STS.HS.8.2.a Compare the different types of cargo with the different modes of transportation.

STS.HS.8.2.b Explain order processing, receiving, storage, retrieval, packaging, and shipping of a product in the global supply chain logistics life cycle.

STS.HS.8.3 Explain the purpose and components of transportation logistics.

STS.HS.8.3.a Explain dispatch.

STS.HS.8.3.b Explain the purpose of tracking of products as they are transported throughout t he supply chain.

STS.HS.8.3.c Identify the components that impact transportation logistics (i.e., routing, scheduling, equipment, operator, etc.).

STS.HS.8.3.d Explain types of shipping documentation and terminology.

STS.HS.8.3.e Explain strategic, tactical, and systems planning.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES

COURSE DESCRIPTION

This introductory course provides the skills and technical knowledge for a beginning student in areas of industry, safety, material, equipment, and process understanding. This entry level course helps students gain a foundation in all areas of Skilled and Technical Sciences including Architecture and Construction; Energy and Engineering; Manufacturing; and Transportation, Distribution, and Logistics.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.20.1 Apply safety principles, practices, philosophy, and guidelines to the work environment.

STS.HS.20.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.20.1.b Employ appropriate Personal Protective Equipment (PPE) while in the lab setting.

STS.HS.20.1.c Employ eye protection in compliance with Neb. Rev. Statute 79-715.

STS.HS.20.1.d Employ the safe application of tools and machines.

STS.HS.20.1.e Explain the main hazards that are possible in the lab setting.

STS.HS.20.1.f Demonstrate proper handling and storing of materials.

STS.HS.20.2 Identify career opportunities in Skilled and Technical Sciences areas.

STS.HS.20.2.a Identify responsibilities and characteristics of professionals in a skilled and technical sciences industry.

STS.HS.20.2.b Describe work behaviors needed to be employable in a skilled and technical sciences industry.

STS.HS.20.2.c Identify the training, education, certification, and licensing requirements for various careers in a skilled and technical sciences industry.

STS.HS.20.2.d Identify high wage, high demand, and high skill careers in skilled and technical sciences.

INTRODUCTION TO SKILLS AND TECHNICAL SCIENCES (cont.)

STS.HS.20.3 Apply appropriate academic and technical skills to produce a product.

STS.HS.20.3.a Employ project-related math operations and formulas.

STS.HS.20.3.b Employ effective verbal, written, and/or visual communication skills.

STS.HS.20.3.c Define course content vocabulary.

STS.HS.20.3.d Conduct the accurate use of measurement tools

STS.HS.20.4 Identify the materials, tools, machines, and equipment required to produce a product.

STS.HS.20.4.a Identify types of materials to be used for various products.

STS.HS.20.4.b Identify types of fasteners for various products.

STS.HS.20.4.c Identify types of adhesives for various products.

STS.HS.20.4.d Identify types of finishes for various products.

STS.HS.20.4.e Identify the correct tools, machines, and equipment appropriate for a specific operation or process.

STS.HS.20.5 Produce a product(s).

STS.HS.20.5.a Interpret working drawings of a product to be produced.

STS.HS.20.5.b Select the proper materials adhesives, fasteners and finishes for a product.

STS.HS.20.5.c Demonstrate the proper tool, machine, or equipment selection and usage for each corresponding operation needed to produce a product.

STS.HS.20.5.d Execute a plan of procedure.

POWER EQUIPMENT

COURSE DESCRIPTION

This introductory course is designed to develop skills in the operation, service, maintenance, and repair of small gas engine and powered equipment. The material covered in this course will be an entryway to other transportation courses.

Target Grades 6-12.

STANDARDS AND INDICATORS:

STS.HS.28.1 Apply safety principles, practices, and guidelines to the work environment.

- STS.HS.28.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.28.1.b Identify and explain the use of personal protective equipment.
- STS.HS.28.1.c Describe proper use of a fire extinguisher.
- STS.HS.28.1.d Demonstrate power equipment battery safety best-practices.
- STS.HS.28.1.e Apply the safe use of tools, machines, and equipment in alignment with industry standards to maintain a safe workplace.
- STS.HS.28.1.f Describe the role of government agencies in providing a safe workplace.
- STS.HS.28.1g Describe the safe and environmental disposal of fluids.

STS.HS.28.2 Identify career opportunities in the Power Equipment industry.

- STS.HS.28.2.a List the most common power equipment careers and related fields of employment.
- STS.HS.28.2.b List the traits & skills employers look for in their employees.
- STS.HS.28.2.c Explain how to find job openings in the power equipment field & identify employment trends.
- STS.HS.28.2.d Explain the specialized tasks completed by each type of technician.
- STS.HS.28.2.e Explain the types of repair facilities.
- STS.HS.28.2.f Summarize the different systems used to pay technicians.
- STS.HS.28.2.g Identify the training, education, certification, and licensing requirements for various careers in the power equipment industry.

POWER EQUIPMENT (cont.)

STS.HS.28.3 Identify fundamentals of power equipment measurement and math.

STS.HS.28.3.a Measure power equipment parts and measurements using both English and metric measuring systems.

STS.HS.28.3.b Identify and use basic measuring tools.

STS.HS.28.3.c Solve power equipment problems using basic math skills.

STS.HS.28.4 Explain fundamentals of Power Equipment Service Information.

STS.HS.28.4.a Describe the different types of service information.

STS.HS.28.4.b Explain the different kinds of information and Illustrations used in service information.

STS.HS.28.4.c Utilize print and/or online service information.

STS.HS.28.4.d Explain how to read and use shop work orders.

STS.HS.28.4.e Describe how to order parts for repair.

STS.HS.28.5 Explain fundamentals of fasteners, gaskets, seals, and sealants used in Power Equipment.

STS.HS.28.5.a Identify commonly used power equipment fasteners.

STS.HS.28.5.b Select and use fasteners properly.

STS.HS.28.5.c Remove, select, and install gaskets, seals, and sealants correctly.

POWER EQUIPMENT (cont.)

STS.HS.28.6 Explain fundamentals of power equipment principles of engine operation.

STS.HS.28.6.a Explain simple engine operation.

STS.HS.28.6.b Describe four-stroke engine operation and explain the purpose of each stroke.

STS.HS.28.6.c Describe two-stroke engine operation and explain the principles of two-cycle operation.

STS.HS.28.6.d List the advantages and disadvantages of two-stroke and four-stroke engines.

STS.HS.28.7 Explain fundamentals of Power Equipment engine components and systems.

STS.HS.28.7.a Describe the function of major moving components (e.g., piston, crankshaft, camshaft, valves).

STS.HS.28.7.b Describe the fundamentals of power equipment fuel supply and air induction.

STS.HS.28.7.c Describe the fundamentals of Power Equipment Ignition Systems.

STS.HS.28.7.d Describe the fundamentals of power equipment lubrication Systems.

STS.HS.28.7.e Describe the fundamentals of Power Equipment Cooling Systems.

STS.HS.28.8 Demonstrate the fundamentals of power equipment engine disassembly, inspection and reassembly.

STS.HS.28.8.a List the steps involved in disassembling an engine.

STS.HS.28.8.b Explain how to inspect various engine parts for damage and wear.

STS.HS.28.8.c Describe the procedure for removing an engine from an implement.

STS.HS.28.8.d Explain how to inspect engines for problems.

STS.HS.28.8.e Demonstrate power equipment engine assembly.

POWER EQUIPMENT (cont.)

STS.HS.28.9 Explain fundamentals of Power Equipment Preventative Maintenance & Troubleshooting.

STS.HS.28.9.a Explain the steps to perform preventive maintenance on various engine systems.

STS.HS.28.9.b Summarize the steps to change the oil in a four-cycle engine.

STS.HS.28.9.c Describe the steps to prepare an engine for storage.

STS.HS.28.9.d Describe systematic troubleshooting.

STS.HS.28.9.e Explain the importance of manufacturers' service manuals to determine engine specifications and explain why this information is necessary when servicing a small engine.

STS.HS.28.9.f Discuss the importance of a maintenance schedule and records.

TRANSPORTATION 1

COURSE DESCRIPTION

This intermediate course will provide students with basic knowledge and skills of the tools and systems needed to be a TDL technician. The student will create foundational knowledge and skills to prepare them for being a conscientious automotive owner or to further their skills to find a career in the TDL industry.

Target Grades 9-12.

STANDARDS AND INDICATORS:

STS.HS.32.1 Explain safety principles, practices, and guidelines to the work environment.

STS.HS.32.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.32.1.b Employ the use of personal protective equipment (PPE).

STS.HS.32.1.c Describe proper use of a fire extinguisher.

STS.HS.32.1.d Demonstrate automotive lift safety best–practices.

STS.HS.32.1.e Demonstrate automotive battery safety best-practices.

STS.HS.32.1.f Describe the role of government agencies in providing a safe workplace.

STS.HS.32.1.g Explain the safe and environmental disposal of fluids.

STS.HS.32.2 Identify career opportunities in the transportation industry.

STS.HS.32.2.a List the most common transportation careers and related fields of employment.

STS.HS.32.2.b List the traits and skills employers look for in their employees.

STS.HS.32.2.c Explain the specialized tasks completed by each type of technician.

STS.HS.32.2.d Identify the training, education, certification, and licensing requirements for various careers in the transportation industry.

TRANSPORTATION 1 (cont.)

STS.HS.32.3 Explain proper usage of hand tools, power tools, fasteners, and equipment.

STS.HS.32.3.a Identify common hand tools, power tools, and equipment needed for diagnosis and repair of the automobile or mobile equipment.

STS.HS.32.3.b Identify and use basic measuring tools.

STS.HS.32.3.c Identify proper fasteners, gaskets, seals, and sealants used in transportation.

STS.HS.32.4 Describe the systems and components in an automobile.

STS.HS.32.4.a Identify the major parts of a typical automotive engine.

STS.HS.32.4.b Explain the basic function of the major parts of an automotive engine.

STS.HS.32.5 Explain the fundamentals of vehicle maintenance and fluid service.

STS.HS.32.5.a Describe the steps to check a vehicle's fluid levels.

STS.HS.32.5.b Explain the importance of vehicle maintenance.

STS.HS.32.5.c Identify the process to locate and identify fluid leaks.

STS.HS.32.5.d Outline the process to complete an oil and filter change.

STS.HS.32.5.e Describe the process to perform a vehicle grease maintenance.

STS.HS.32.5.f Explain the process of how to inspect for general problems with air filters, hoses, belts, pulleys, and other components.

TRANSPORTATION 1 (cont.)

STS.HS.32.6 Explain the fundamentals of vehicle exterior maintenance.

STS.HS.32.6.a Describe the importance of keeping a vehicle's exterior clean.

STS.HS.32.6.b Identify the proper tools and materials needed to wash and wax a vehicle's exterior.

STS.HS.32.6.c Explain the importance of using the correct soaps and cleaning products.

STS.HS.32.6.d Describe the steps to washing and drying a vehicle.

STS.HS.32.7 Explain fundamentals of researching, purchasing, and owning a vehicle.

STS.HS.32.7.a Explain the costs of owning and operating a car.

STS.HS.32.7.b Identify models and submodels of vehicles.

STS.HS.32.7.c Describe how to search and locate vehicles for sale.

STS.HS.32.7.d Differentiate the benefits versus cost of buying new or used vehicles.

TRANSPORTATION 2

COURSE DESCRIPTION

This capstone course will expand on the basic concepts and systems needed by the TDL technician. It will focus on service and maintenance of automobiles and mobile equipment. Specific maintenance requirements with the various systems of the automobile and mobile equipment will be covered as well as replacement of needed parts. This course will help students that want to know how to keep a vehicle running in good order and for those that would like to continue on in the TDL field.

Target Grades 10-12.

STANDARDS AND INDICATORS:

STS.HS.33.1 Explain safety principles, practices, and guidelines to the work environment.

STS.HS.33.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.33.1.b Identify and explain the use of personal protective equipment.

STS.HS.33.1.c Describe proper use of a fire extinguisher.

STS.HS.33.1.d Demonstrate automotive lift safety best–practices.

STS.HS.33.1.e Demonstrate automotive battery safety best-practices.

STS.HS.33.1.f Apply the safe use of tools, machines, and equipment in alignment with industry standards to maintain a safe workplace.

STS.HS.33.1.g Describe the role of government agencies in providing a safe workplace.

STS.HS.33.1.h Explain the purpose for safe and environmental disposal of fluids.

STS.HS.33.2 Identify career opportunities in the transportation industry.

STS.HS.33.2.a Identify the most common transportation careers and related fields of employment.

STS.HS.33.2.b Identify the traits and skills employers look for in their employees.

STS.HS.33.2.c Identify the training, education, certification, and licensing requirements for various careers in the transportation industry.

TRANSPORTATION 2 (cont.)

STS.HS.33.3 Identify correct tools, equipment and fasteners needed to diagnose and repair automobiles and mobile equipment.

STS.HS.33.3.a Identify common hand tools, power tools, and equipment needed for diagnosis and repair of the automobile or mobile equipment.

STS.HS.33.3 .b Describe the different types of service information platforms.

STS.HS.33.3.c Explain fundamentals of on–board diagnostics and scan tools.

STS.HS.33.3.d Identify proper fasteners, gaskets, seals, and sealants used in transportation.

STS.HS.33.4 Summarize the various systems used on automobiles and mobile equipment.

STS.HS.33.4.a Explain the fundamentals of the lubrication system.

STS.HS.33.4.b Explain the fundamentals of the fuel system.

STS.HS.33.4.c Explain the fundamentals of the cooling system.

STS.HS.33.4.d Explain the fundamentals of the brake system.

STS.HS.33.4.e Explain the fundamentals of the suspension system.

STS.HS.33.4.f Explain the fundamentals of the electrical system.

STS.HS.33.4.g Explain the fundamentals of the ignition system.

STS.HS.33.4.h Explain the fundamentals of the exhaust system.

COLLISION REPAIR

COURSE DESCRIPTION

This capstone course exposes students to the knowledge and skills needed to be a collision repair and refinishing technician. Safety, materials, tools and estimating will be included in the instruction. Working experience will also be included.

Target Grades 11-12.

STANDARDS AND INDICATORS:

STS.HS.9.1 Demonstrate safety principles, practices, and guidelines to the work environment.

- STS.HS.9.1.a Complete applicable safety assessment with 100% accuracy.
- STS.HS.9.1.b Identify and explain the use of personal protective equipment.
- STS.HS.9.1.c Describe proper use of a fire extinguisher.
- STS.HS.9.1.d Demonstrate automotive lift safety best-practices.
- STS.HS.9.1.e Demonstrate automotive battery safety best-practices.
- STS.HS.9.1.f Demonstrate the safe use of tools, machines, and equipment in alignment with industry standards to maintain a safe workplace.
- STS.HS.9.1.g Describe the role of government agencies in providing a safe workplace.

STS.HS.9.2 Explain proper usage of hand tools, power tools, fasteners, and equipment.

- STS.HS.9.2.a Identify common hand tools, power tools, and equipment needed for diagnosis and repair of the automobile or mobile equipment.
- STS.HS.9.2.b Identify and use basic measuring tools.
- STS.HS.9.2.c Identify proper fasteners, gaskets, seals, and sealants used in transportation.

COLLISION REPAIR (cont.)

STS.HS.9.3 Identify career opportunities in the transportation industry.

STS.HS.9.3.a List the most common transportation careers and related fields of employment.

STS.HS.9.3.b List the traits and skills employers look for in their employees.

STS.HS.9.3.c Explain the specialized tasks completed by a collision repair technician.

.

STS.HS.9.3.d Identify the training, education, certification, and licensing requirements for various careers in the transportation industry.

STS.HS.9.4 Explain fundamentals of Collision Repair and Refinishing measurement and math.

STS.HS.9.4.a Employ both customary and metric measuring systems.

STS.HS.9.4.b Identify and use basic collision repair and refinishing measuring tools.

STS.HS.9.4.c Employ basic math skills used in collision repair and refinishing.

STS.HS.9.5 Identify fundamentals of Collision Repair Information.

STS.HS.9.5.a Describe the different types of service information.

STS.HS.9.5.b Explain the different kinds of information and Illustrations used in service information.

STS.HS.9.5.c Utilize print and online service information.

STS.HS.9.5.d Understand shop work orders.

STS.HS.9.5.e Describe how to order parts for repair.

COLLISION REPAIR (cont.)

STS.HS.9.6 Explain fundamentals of Nonstructural Repairs.

STS.HS.9.6.a	Describe steps for a nonstructural panel repair.
STS.HS.9.6.b	Explain steps for a bolted nonstructural panel replacement.
STS.HS.9.6.c	Identify the procedure to repair welded and bonded nonstructural panel replacement.
STS.HS.9.6.d	Recall steps and procedures for plastic repair.
STS.HS.9.6.e	Describe steps for glass repair.

STS.HS.9.7 Explain fundamentals of Structural Repairs.

STS.HS.9.7.a	Identify unibody/frame-straightening equipment.
STS.HS.9.7.b	Discuss the various types of measurements used for structural repairs.
STS.HS.9.7.c	Describe the steps for unibody straightening.
STS.HS.9.7.d	Identify the steps for full frame repair.
STS.HS.9.7.e	Summarize the process for various types of structural component replacement.

STS.HS.9.8 Explain fundamentals of Refinishing Technology used in Collision Repair.

STS.HS.9.8.a	Explain various refinishing materials used.
STS.HS.9.8.b	Describe steps for paint mixing and reducing.
STS.HS.9.8.c	Explain correct spray techniques.
STS.HS.9.8.d	Explain various techniques for surface preparation.
STS.HS.9.8.e	Identify steps for color matching.
STS.HS.9.8.f	Describe the process for paint application.
STS.HS.9.8.g	Explain the steps used in detailing.

STS.HS.9.9 Explain fundamentals of Estimating used in Collision Repair.

STS.HS.9.9.a	Describe the process of collision repair estimating.
STS.HS.9.9.b	Describe the steps involved in completing a repair estimate.
STS.HS.9.9.c	Explain the process for completing an estimate.

TRANSPORTATION 3

COURSE DESCRIPTION

This extended learning course focuses on the diagnosis, service, and repair of automobile and mobile equipment. This course will prepare students for postsecondary education and entry into the career.

Target Grades 11-12.

STANDARDS AND INDICATORS:

STS.HS.34.1 Apply safety principles, practices, and guidelines to the work environment.

STS.HS.34.1.a Complete applicable safety assessment with 100% accuracy.

STS.HS.34.1.b Identify and explain the use of personal protective equipment.

STS.HS.34.1.c Describe proper use of a fire extinguisher.

STS.HS.34.1.d Demonstrate automotive lift safety best–practices.

STS.HS.34.1.e Demonstrate automotive battery safety best–practices.

STS.HS.34.1.f Apply the safe use of tools, machines, and equipment in alignment with industry standards to maintain a safe workplace.

STS.HS.34.1.g Describe the role of government agencies in providing a safe workplace.

STS.HS.34.1.h Describe the safe and environmental disposal of fluids.

STS.HS.34.2 Identify career opportunities in the transportation industry.

STS.HS.34.2.a List the most common transportation careers and related fields of employment.

STS.HS.34.2.b List the traits and skills employers look for in their employees.

STS.HS.34.2.c Explain how to find job openings in the transportation field.

STS.HS.34.2.d Explain the specialized tasks completed by each type of technician.

STS.HS.34.2.e Identify the training, education, certification, and licensing requirements for various careers in the transportation industry.

TRANSPORTATION 3 (cont.)

STS.HS.34.3 Identify fundamentals of transportation measurement and service information.

STS.HS.34.3.a Measure with both customary and metric measuring systems.

STS.HS.34.3.b Identify and use proper measuring tools for each task.

STS.HS.34.3.c Describe the different types of service information.

STS.HS.34.3.d Explain how to read shop work orders.

STS.HS.34.4 Identify correct tools, equipment and fasteners needed to diagnose and repair automobiles and mobile equipment.

STS.HS.34.4.a Identify common hand tools, power tools, and equipment needed for diagnosis and repair of the automobile or mobile equipment.

STS.HS.34.4.b Describe the different types of service information platforms.

STS.HS.34.4.c Explain fundamentals of on–board diagnostics and scan tools.

STS.HS.34.4.d Identify proper fasteners, gaskets, seals, and sealants used in transportation.

STS.HS.34.5 Explain fundamentals of vehicle systems and principles.

STS.HS.34.5.a Explain the principles of electricity and magnetism.

STS.HS.34.5.b Explain fundamentals of engine mechanical problem diagnosis.

STS.HS.34.5.c Explain fundamentals of engine top end rebuilding.

STS.HS.34.5.d Explain fundamentals of engine front end service.

STS.HS.34.5.e Explain fundamentals of short block service.

STS.HS.34.5.f Explain fundamentals of manual transmission, clutch, and automatic transmission technology.

STS.HS.34.5.g Explain fundamentals of front and rear drive train technology.

STS.HS.34.5.h Explain fundamentals of heating and air conditioning.

STS.HS.34.5.i Explain fundamentals of diesel injection, turbochargers, and superchargers fundamentals.

STS.HS.34.5.j Explain fundamentals of wheel alignment.

STS.HS.34.5.k Explain fundamentals of restraint systems.