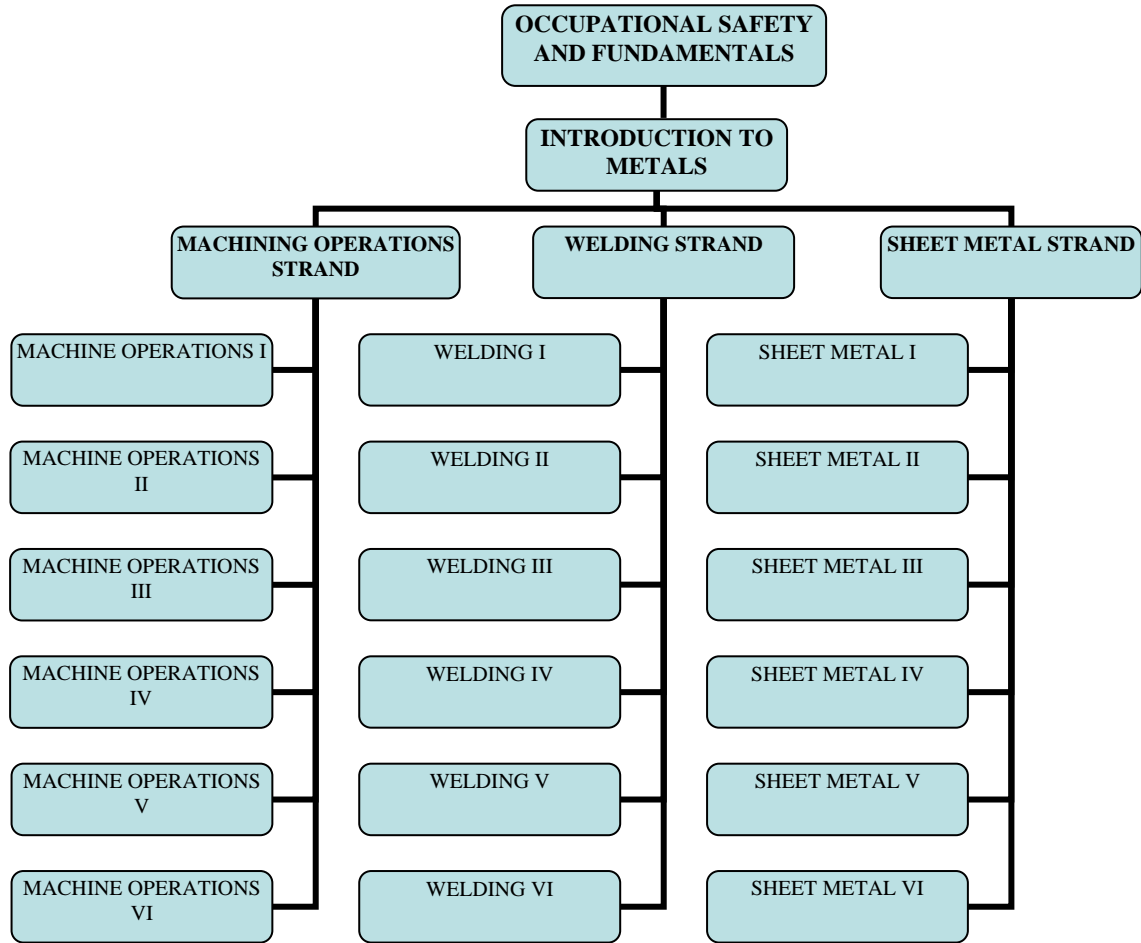


Implementation date
 Fall 2010

METALS TECHNOLOGY PATHWAY MAP



This Metals Technology Pathway is designed to prepare a student with foundational knowledge and skills for a career in one of three possible crafts. As the student progresses through the Pathway they are given the opportunity to explore three craft areas on an introductory level. Once they have completed the foundational and introductory levels they are then given the option to “major” in at least one of three craft areas. These areas are Machining Operations, Welding, or Sheet Metal. Successful completion of this Pathway includes four units consisting of Occupational Safety and Fundamentals; Introduction to Metals; and Levels I and II within one craft area.

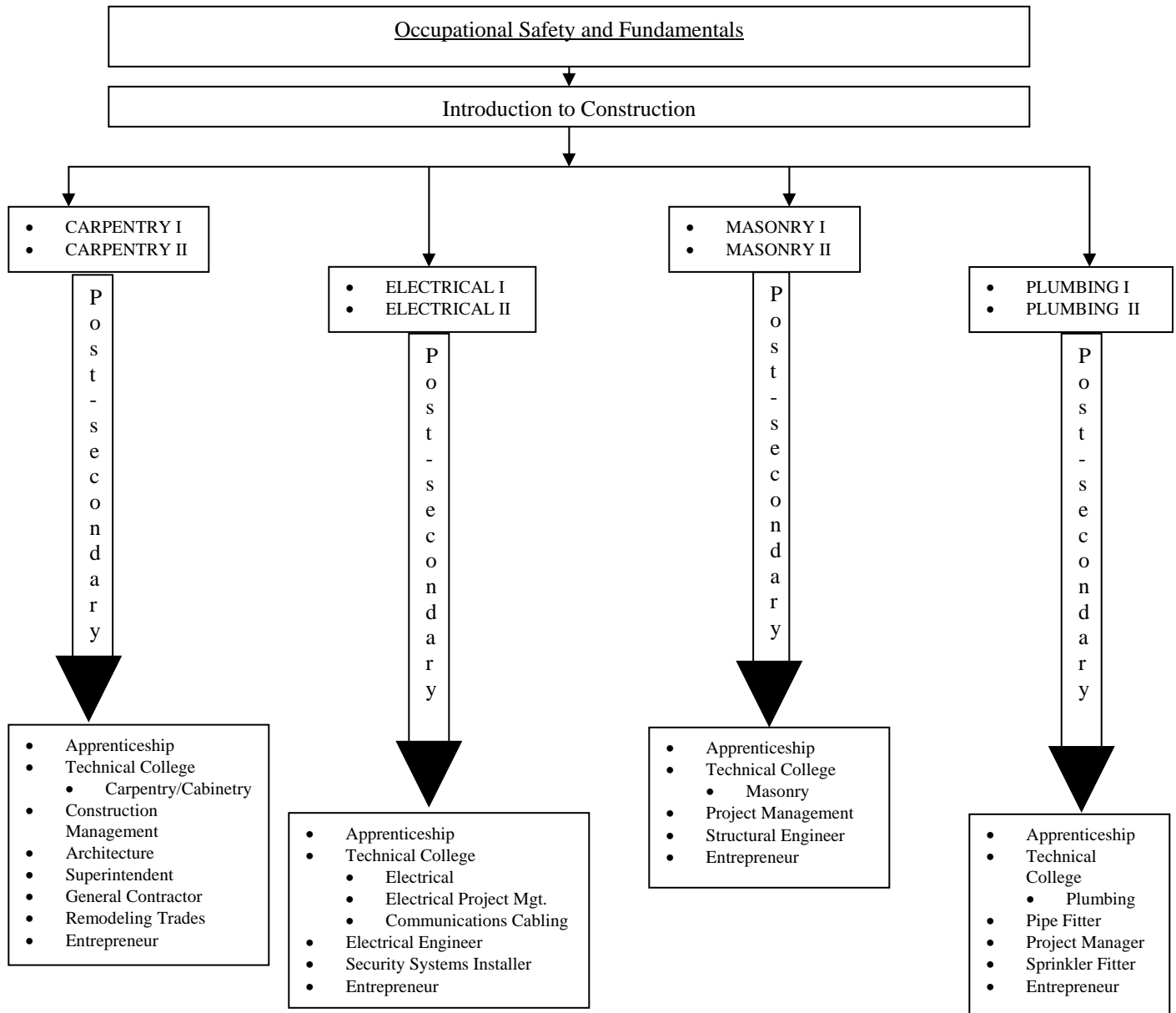
Implementation Date
Fall 2008

PROGRAM CONCENTRATION: **Architecture, Construction,
Communications & Transportation**
CAREER PATHWAY: **Construction**

This Pathway is designed to prepare a student with foundational knowledge and skills for a construction career in one of four possible construction crafts. It also is a good pathway for a student to prepare for a variety of opportunities in addition to the craft areas, such as Architecture, Construction Engineering and Construction Management.

As the student progresses through the pathway, they are given the opportunity to explore four construction craft areas on an introductory level. Once they have completed the foundational and introductory levels they are then given the option to “major” in at least one of four craft areas. These areas are Carpentry, Masonry, Electrical, and Plumbing. Upon successful completion of four units within this Pathway, in an Industry Accredited Program, the student will earn at least two industry credentials with the possibility of others.

The Construction Career Pathway Map



Implementation Date
Fall 2008

PROGRAM CONCENTRATION: Architecture, Construction,
Communications & Transportation
CAREER PATHWAY: Construction
COURSE TITLE: Occupational Safety and Fundamentals

This course is the foundational course that prepares students for a pursuit of any career in the field of construction. It prepares the student for the basic knowledge to function safely on or around a construction site and in the industry in general. It provides the student with the option for an Industry Certification in the Construction Core.

This course explains the safety obligations of workers, supervisors, and managers to ensure a safe workplace. Course content discusses the causes and results of accidents and the dangers of rationalizing risks. It includes the basic content of OSHA 10-hour safety standards. It also includes the basic knowledge and skills needed in the following areas: construction math, hand and power tools used in the field, general blueprints, and basics of rigging safety.

ACT-OSF-1. Students will understand and practice construction safety.

- a. Demonstrate knowledge of use and care of PPE.
- b. Demonstrate a basic knowledge of OSHA and its regulations.
- c. Demonstrate a basic knowledge of safety as related to aerial work, electricity, and fire.

ACADEMIC STANDARDS:

MC1P4. Students will make connections among mathematical ideas and to other disciplines.

SSCG15. The student will explain the functions of the departments and agencies of the federal bureaucracy.

ELA9RC3. The student acquires new vocabulary in each content area and uses it correctly.

ACT-OSF-2. Students will understand and apply math concepts as applied to construction.

- a. Demonstrate knowledge and application of measuring.
- b. Apply basic math computations to construction settings.
- c. Apply basic geometric calculations including the 3-4-5 rule.
- d. Demonstrate knowledge and application of area and volume calculations.

ACADEMIC STANDARDS:

MC1G1. Students will investigate properties of geometric figures in the coordinate plane.

Implementation Date
Fall 2008

MC2P1. Students will solve problems (using appropriate technology)

MC2P3. Students will communicate mathematically.

MC2P4. Students will make connections among mathematical ideas and to other disciplines.

MC3G1. Students will identify and use special right triangles.

MC3G2. Students will define and apply sine, cosine, and tangent ratios to right triangles.

MC4A2. Students will solve quadratic equations and inequalities in one variable.

MC4G1. Students will understand the properties of circles.

MM1A2. Students will simplify and operate with radical expressions, polynomials, and rational expressions.

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

MM2G1. Students will identify and use special right triangles.

MM2G3. Students will understand the properties of circles.

ELA9W3. The student uses research and technology to support writing.

ACT-OSF-3. Students will use basic hand and power tools in a professional and safe manner.

- a. Demonstrate knowledge of rules and regulations regarding the safe use of hand and power tools.
- b. Demonstrate knowledge of the care and maintenance of hand and power tools.
- c. Demonstrate knowledge of proper usage techniques of hand and power tools.

ACADEMIC STANDARDS:

SSCG15. The student will explain the functions of the departments and agencies of the federal bureaucracy.

ELA9LSV1. The student participates in student-to-teacher, student-to-student, and group verbal interactions.

ACT-OSF-4. Students will demonstrate knowledge of blueprint terms, components, and symbols.

Implementation Date
Fall 2008

- a. Demonstrate knowledge of blueprint terms.
- b. Demonstrate knowledge of blueprint components.
- c. Demonstrate knowledge of blueprint symbols.

ACADEMIC STANDARDS:

MC1G1. Students will investigate properties of geometric figures in the coordinate plane.

MC1P3. Students will communicate mathematically.

MC2P4. Students will make connections among mathematical ideas and to other disciplines.

SSCG18. The student will demonstrate knowledge of the powers of Georgia's state and local governments.

ELA9RL5. Student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA9RC3. The student acquires new vocabulary in each content area and uses it correctly.

ELA9W3. The student uses research and technology to support writing.

ACT-OSF-5. Students will explain and implement safe rigging procedures.

- a. Demonstrate the knowledge of basic rigging equipment.
- b. Demonstrate the knowledge of basic rigging communication.
- c. Demonstrate the knowledge of basic rigging safety.

ACADEMIC STANDARDS:

MC1G1. Students will investigate properties of geometric figures in the coordinate plane.

MC1P3. Students will communicate mathematically.

MC2P4. Students will make connections among mathematical ideas and to other disciplines.

SSCG15. The student will explain the functions of the departments and agencies of the federal bureaucracy.

SSCG18. The student will demonstrate knowledge of the powers of Georgia's state and local governments.

Implementation Date
Fall 2008

ELA9RL5. Student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA9C1. The student demonstrates understanding and control of the rules of the English language, realizing that the usage involves appropriate applications of conventions and grammar in both written and spoken formats.

SP1. Students will analyze the relationships between force, mass, gravity, and the motion of objects.

ACT-OSF-6. Students will explore career pathways in the construction industry.

- a. Demonstrate knowledge of the job opportunities that are available to entry level employees.
- b. Demonstrate knowledge of the post-secondary training opportunities that are available.
- c. Demonstrate knowledge of the industry licenses and certifications available.

ACADEMIC STANDARDS:

SSWH20. The student will examine change and continuity in the world since the 1960's.

SSEF3. The student will explain how specialization and voluntary exchange between buyers and sellers increase the satisfaction of both parties.

SSEM13. The student will explain how markets, prices and competition influence economic behavior.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and post secondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

Implementation Date
Fall 2008

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

Implementation date

Fall 2010

PROGRAM CONCENTRATION:

**Architecture, Construction,
Communications & Transportation**

CAREER PATHWAY:

METALS TECHNOLOGY

COURSE TITLE:

Introduction to Metals

Prerequisite:

Occupational Safety and Fundamentals

The metals technology curriculum, Introduction to Metals, is designed to acquaint participants with the three major technical occupations (welding, sheet metal, and machining) that are available in the metal forming, manufacturing, and metals/construction industries. The various activities equip high school students with the skills needed to select a metal industry occupation, enter the work force, and continue to advance in one of these specialized metals occupations. Experiences include an introduction to the basic requirements of each of these fields, exposure to the structure and nature of career opportunities, and an introduction to types of training and skills required and the use of specialized tools, equipment, and materials. This course is designed to familiarize students with fundamentals of various metal occupations for the purpose of preparing them to select either welding, sheet metal, or machining for more highly specialized training in subsequent courses. Minimum performance requirements for this course are based on successful student completion according to the National Center for Construction Education and Research Center (NCCER) Occupation Standards and the National Institute for Metalforming Skills (NIMS) standards. Students who successfully complete the course in accordance with NCCER standards are eligible for registration with the NCCER National Craft Worker Registry or obtain NIMS credentials.

CAREERS, ETHICS, AND HISTORY OF MACHINING, SHEETMETAL, AND WELDING

This course will acquaint the students with the history of the machining trade, equipment used in the trade, attributes of successful machinists, sheet metal workers, welders, industry credentialing, and career opportunities. Course topics include safety, applied mathematics, measuring instruments, blueprint reading, and metallurgy. Practical experience will be gained in the proper use and maintenance of hand tools, power tools and equipment used in the industry. Additional topics address quality control, environmental protection, and housekeeping. Co-curricular activities of Skills USA are incorporated in the course. Students who successfully complete the course are eligible to enroll in machining operations I, sheet metal I, or welding I courses.

HISTORY

ACCT-ITM-1. Students will explore the history of the machining, welding, and sheet-metal trade

- a. Summarize the history of the machining, welding, and sheet-metal trade.

Academic Standards:

Implementation date

Fall 2010

SSUSH7 Students will explain the process of economic growth, its regional and national impact in the first half of the 19th century, and the different responses to it.

SAFETY

ACCT-ITM-2. Students will demonstrate knowledge of safety in the metals laboratory.

- a. Identify some common hazards in machining, sheet metal, and welding.
- b. Explain and identify proper personal protection used in machining, sheet metal, and welding.
- c. Demonstrate proper material handling methods.
- d. Demonstrate safety rules for operating tools in the metals lab.

Academic Standards:

SEV5. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.

- e. Describe the effects and potential implications of pollution and resource depletion on the environment at the local and global levels (*e.g.* air and water pollution, solid waste disposal, depletion of the stratospheric ozone, global warming, and land uses).

TOOLS OF THE TRADE

ACCT-ITM-3. Students will demonstrate proficiency in the use of hand tools and power tools specific to the trade.

- a. Demonstrate proficiency using tools related to the metals trade in a safe and appropriate manner.
- b. Demonstrate proficiency in proper maintenance and care of tools in the metals trade.

MEASURING INSTRUMENTS

ACCT-ITM-4. Students will demonstrate the ability to use measuring instruments specific to the metals trade.

- a. Demonstrate proficiency measuring work pieces with a standard steel rule to the nearest 1/64”.
- b. Demonstrate proficiency in the proper care, cleaning, and storage of measuring instruments.
- c. Demonstrate proficiency in the use of measuring tools used in machining, sheet metal, and welding.

Academic Standards:

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

Implementation date
Fall 2010

- a. Determine the sum of interior and exterior angles in a polygon.
- b. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.
- c. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).

INTRO TO WELDING

ACCT-ITM-5. Students will demonstrate the ability to safely set up and use the oxyfuel cutting torch and SMAW equipment.

- a. Identify and explain the use of oxyfuel cutting equipment.
- b. Demonstrate proficiency in safely set up and shutting down an oxyfuel cutting outfit.
- c. Perform basic oxyfuel cutting
- d. Identify and explain shielded metal arc welding (SMAW) safety.
- e. Identify and explain welding electrical current.
- f. Identify and explain arc welding machines.
- g. Demonstrate proficiency in safely setting up SMAW equipment.
- h. Demonstrate proficiency striking an arc.
- i. Demonstrate proficiency running stringer beads.

Academic Standards:

SPS10. Students will investigate the properties of electricity and magnetism.

- a. Investigate static electricity in terms of
 - friction
 - induction
 - conduction
- b. Explain the flow of electrons in terms of
 - alternating and direct current.
 - the relationship among voltage, resistance and current.

SPS4. Students will investigate the arrangement of the Periodic Table.

- a. Determine the trends of the following:
 - Location of metals, nonmetals, and metalloids

INTRO TO SHEET METAL

ACCT-ITM- 6. Students will demonstrate the ability to use basic hand tools and equipment specific to sheet metal.

- a. Demonstrate proficiency in the selection and use of layout and marking tools used by sheet metal workers.
- b. Demonstrate proficiency in the selection of hand tools used for cutting out sheet metal parts and patterns.
- c. Demonstrate proficiency in the selection and use of sheet metal equipment as applied to straight line development.

Implementation date
Fall 2010

Academic Standards:

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

- a. Determine the distance between two points.
- b. Determine the distance between a point and a line.
- c. Determine the midpoint of a segment.
- d. Understand the distance formula as an application of the Pythagorean theorem.
- e. Use the coordinate plane to investigate properties of and verify conjecture related to triangles and quadrilaterals.

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

- d. Determine the sum of interior and exterior angles in a polygon.
- e. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.
- f. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).
- g. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.
- h. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

MM2G1. Students will identify and use special right triangles.

- a. Determine the lengths of sides of 30° - 60° - 90° triangles.
- b. Determine the lengths of sides of 45° - 45° - 90° triangles.

MM2G3. Students will understand the properties of circles.

- a. Understand and use properties of chords, tangents, and secants as an application of triangle similarity.
- b. Understand and use properties of central, inscribed, and related angles.
- c. Use the properties of circles to solve problems involving the length of an arc and the area of a sector.
- d. Justify measurements and relationships in circles using geometric and algebraic properties.

MM2G4. Students will find and compare the measures of spheres.

- a. Use and apply surface area and volume of a sphere.
- b. Determine the effect on surface area and volume of changing the radius or diameter of a sphere.

INTRO TO MACHINING

Implementation date
Fall 2010

ACCT-ITM-7. Students will demonstrate the ability to use basic hand tools and equipment specific to machining.

- a. Demonstrate proficiency in the selection and use of basic layout tools used by machinist.
- b. Demonstrate proficiency in the selection and use of machine shop equipment to produce basic layout projects.

Academic Standards:

MM2G1. Students will identify and use special right triangles.

- a. Determine the lengths of sides of 30° - 60° - 90° triangles.
- b. Determine the lengths of sides of 45° - 45° - 90° triangles.

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

- a. Determine the sum of interior and exterior angles in a polygon.
- b. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.
- c. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).
- d. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.
- e. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

- a. Determine the distance between two points.
- b. Determine the distance between a point and a line.
- c. Determine the midpoint of a segment.
- d. Understand the distance formula as an application of the Pythagorean theorem.
- e. Use the coordinate plane to investigate properties of and verify conjecture related to triangles and quadrilaterals.

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning

Implementation date

Fall 2010

(language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

- a. Reading in all curriculum areas
 - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
 - Read both informational and fictional texts in a variety of genres and modes of discourse.
 - Read technical texts related to various subject areas.
- b. Discussing books
 - Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.
 - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
 - Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.
 - Explore understanding of new words found in subject area texts.
- d. Establishing context
 - Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.

Implementation date
Fall 2010

- Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical, and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health, and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

Implementation date

Fall 2010

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

Implementation date
Fall 2010

PROGRAM CONCENTRATION:

**Architecture, Construction,
Communications & Transportation**

CAREER PATHWAY:

METALS TECHNOLOGY

COURSE TITLE:

Machining Operations I

Prerequisite:

Introduction to Metals

The metals technology curriculum, Metals I This course will provide opportunities for students to acquire introductory skills on the lathe and milling machine, equipment used in the trade, attributes of successful machinists, industry credentialing, and career opportunities. Course topics include safety, measuring instruments, blueprint reading, and maintenance. Practical experience will be gained in the proper use and maintenance of hand tools, the pedestal grinder, the drill press, and band saws, job planning and management, quality control, and machinery maintenance. Performance standards for this course are based on National Institute for Metalworking Skills (NIMS) national standards for the topics of lathe and milling machine.

Additional topics address quality control, environmental protection, and housekeeping. Co-curricular activities of Skills USA are incorporated in the course. Students who successfully complete the course are eligible to enroll in Machining Operations II

SAFETY

ACCT-MOI-1. Students will demonstrate safety in the machining lab and classroom.

- a. List general safety rules for the machining laboratory
- b. Identify the location of the following: fire extinguisher(s), eye wash station, first aid kit, emergency electrical shutoff(s)
- c. Describe the types of fires possible in a machining environment and identify the appropriate fire extinguisher for each type of fire
- d. Demonstrate the use of a fire extinguisher
- e. Demonstrate basic first aid to stop bleeding and prevent shock
- f. Describe the procedure for obtaining outside emergency medical response
- g. Demonstrate emergency shutoff procedures
- h. Demonstrate shop evacuation procedures
- i. Identify location of Material Safety and Data Sheets (MSDS)

MEASURING INSTRUMENTS

ACCT-MOI-2. Students will measure with the following to specific tolerances

- a. Measure work pieces with a 6 inch Standard rule
- b. Measure work pieces with a 12 inch Standard rule
- c. Measure work pieces 0-1” Micrometer
- d. Measure work pieces with dial and vernier calipers
- e. Use a dial indicator

Implementation date
Fall 2010

Academic Standards:

- MM2P1. Students will solve problems (using the appropriate technology.)**
- Build new mathematical knowledge through problem solving.
 - Solve problems that arise in mathematics and in other contexts.
 - Apply and adapt a variety of appropriate strategies to solve problems.

BLUEPRINT READING

ACCT-MOI-3. Students will identify and illustrate the following information on blueprints.

- Identify title block and tell what information it contains.
- Identify basic blueprint symbols and lines.

Academic Standards:

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

- Determine the distance between two points.
- Determine the distance between a point and a line.
- Determine the midpoint of a segment.
- Understand the distance formula as an application of the Pythagorean theorem.
- Use the coordinate plane to investigate properties of and verify conjecture related to triangles and quadrilaterals.

PEDESTAL GRINDER

ACCT-MOI-4. Students will demonstrate the ability to properly set up and use the pedestal grinder.

- Inspect and clean a pedestal grinder.
- Inspect and position eye shields and tool rests.
- Dress grinding wheels.
- Sharpen center punches and chisels
- Sharpen drill bits.

DRILL PRESS

ACCT-MOI-5. Students will demonstrate the ability to properly set up and use the drill press.

- Inspect and clean drill press.
- Mount and secure work piece.
- Calculate proper RPMs on the drill press.
- Demonstrate center drilling.
- Drill pilot holes.
- Drill blind holes.

Implementation date
Fall 2010

- g. Drill through holes.

Academic Standards:

- MM4P1. Students will solve problems (using the appropriate technology)**
 - a. Build new mathematical knowledge through problem solving.
 - c. Apply and adapt a variety of appropriate strategies to solve problems.
- SPS7. The students will relate transformations and flow of energy within a system.**
 - b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.
- SPS8. Students will determine relationships among force, mass, and motion.**
 - a. Calculate velocity and acceleration.
 - c. Calculate amounts of work and mechanical advantage using simple machines.

LATHE OPERATIONS

- ACCT-MOI-6. Students will perform the following operations using the lathe.**
 - a. Identify the parts of an engine lathe
 - b. Check oil reservoirs and cutting fluid levels
 - c. Calculate feeds and speeds for various materials and material diameters
 - d. Set up a lathe for various feeds and speeds.
 - e. Grind general lathe cutting tools with a pedestal grinder.
 - f. Demonstrate set-up and alignment of the tool post.
 - g. Demonstrate set-up of the three-jaw chuck.
 - h. Perform facing operations.
 - i. Perform center drilling operations

Academic Standards:

- MM4P1. Students will solve problems (using the appropriate technology)**
 - b. Build new mathematical knowledge through problem solving.
 - c. Apply and adapt a variety of appropriate strategies to solve problems.
- SPS7. The students will relate transformations and flow of energy within a system.**
 - b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.
- SPS8. Students will determine relationships among force, mass, and motion.**
 - a. Calculate velocity and acceleration.
 - c. Calculate amounts of work and mechanical advantage using simple machines.

MILL OPERATIONS

- ACCT-MOI-7. Students will perform the following operations using the milling machine.**

Implementation date
Fall 2010

- a. Identify the parts of a milling machine.
- b. Check oil reservoirs and cutting fluid levels.
- c. Calculate feeds and speeds for various materials and material diameters.
- d. Set up a mill for various feeds and speeds.
- e. Use an edge finder to find the edge of a part.
- f. Perform center drilling operations.
- g. Perform countersinking operations.
- h. Perform drilling operations.
- i. Perform Taping operations.

Academic Standards:

MM2P1. Students will solve problems (using the appropriate technology.)

- d. Build new mathematical knowledge through problem solving.
- e. Solve problems that arise in mathematics and in other contexts.
- f. Apply and adapt a variety of appropriate strategies to solve problems.

SPS7. The students will relate transformations and flow of energy within a system.

- b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.

SPS8. Students will determine relationships among force, mass, and motion.

- a. Calculate velocity and acceleration.
- c. Calculate amounts of work and mechanical advantage using simple machines.

MACHINERY MAINTENANCE

ACCT-MTM-8. Students will perform the following maintenance procedures

- a. Perform incidental and preventative maintenance on a milling machine, lathe, pedestal grinder, and drill press.
- b. Fill out the history form for tracking maintenance
- c. Report maintenance problems to the teacher

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related

Implementation date

Fall 2010

to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

- a. Reading in all curriculum areas
 - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
 - Read both informational and fictional texts in a variety of genres and modes of discourse.
 - Read technical texts related to various subject areas.
- b. Discussing books
 - Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.
 - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
 - Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.
 - Explore understanding of new words found in subject area texts.
- d. Establishing context
 - Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.
 - Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical, and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

Implementation date
Fall 2010

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health, and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

Implementation date
Fall 2010

Implementation date

Fall 2010

PROGRAM CONCENTRATION:

**Architecture, Construction,
Communications & Transportation**

CAREER PATHWAY:

METALS TECHNOLOGY

COURSE TITLE:

Machining Operations II

PREREQUISITE:

Machining Operations I

COURSE DESCRIPTION: This course will provide opportunities for students to acquire introductory skills on the lathe and milling machine. Course topics include safety, blueprint reading, job planning and management, quality control, and machinery maintenance. Performance standards for this course are based on National Institute for Metalworking Skills (NIMS) national standards for the topics of lathe and milling machine. Co-curricular activities of Skills USA are incorporated in the course. Students who successfully complete this course are eligible to enroll in Machining Operations III and/or Machining Operations IV.

SAFETY

ACCT-MOII-1. Students will demonstrate safety in the machining lab and classroom.

- a. Demonstrate general safety rules for the machining laboratory.
- b. Demonstrate the specific safety rules applicable to the machine shop equipment.

BLUEPRINT READING

ACCT-MOII-2. Students will compose blueprints.

- a. Define orthographic projection.
- b. Sketch the top, front, and side views of simple machined parts.
- c. Illustrate proper dimensioning.

Academic standards:

MM2G1. Students will identify and use special right triangles.

- a. Determine the lengths of sides of 30 -60 -90 triangles.
- b. Determine the lengths of sides of 45 -45 90 triangles.

MM2P1. Students will solve problems (using the appropriate technology.)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.

JOB PLANNING AND MANAGEMENT

ACCT-MOII-3. Students will generate job planning sheets for lathe and milling machine projects.

Implementation date
Fall 2010

- a. Develop a process plan and sequence of operations for a part requiring turning.
- b. Develop a process plan and a sequence of operations for a part requiring milling.
- c. Complete a materials list and identify required tools, fixtures, and cutting fluids for a machining operation.

Academic standards:

MM2P1. Students will solve problems (using the appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.

SPS7. The students will relate transformations and flow of energy within a system.

- b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.

SPS8. Students will determine relationships among force, mass, and motion.

- a. Calculate velocity and acceleration.
- c. Calculate amounts of work and mechanical advantage using simple machines.

BASIC LATHE

ACCT-MOII-4. Students will demonstrate the ability to properly set up and use the lathe.

- a. Perform countersinking operations.
- b. Perform drilling operations.
- c. Perform filing operations on a lathe.
- d. Demonstrate set-up of the quick change tool holder.
- e. Center drill work piece for turning between centers.
- f. Perform turning operations to specified tolerances.
- g. Perform boring operations.
- h. Perform counterboring operations.

Academic standards:

MM2P1. Students will solve problems (using the appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- d. Solve problems that arise in mathematics and in other contexts.
- e. Apply and adapt a variety of appropriate strategies to solve problems.

SPS7. The students will relate transformations and flow of energy within a system.

- b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.

SPS8. Students will determine relationships among force, mass, and motion.

- a. Calculate velocity and acceleration.

Implementation date
Fall 2010

- c. Calculate amounts of work and mechanical advantage using simple machines.

BASIC MILL

ACCT-MOII-5. Students will demonstrate the ability to properly set up and use the vertical milling machine.

- a. Set up and dial in a vise.
- b. Identify milling cutters used in vertical milling.
- c. Demonstrate reaming operations.
- d. Demonstrate boring operations.
- e. Demonstrate end milling operations.
- f. Demonstrate face milling operations.
- g. Square a work piece to specified tolerances.

Academic standards:

SPS7. The students will relate transformations and flow of energy within a system.

- b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.

SPS8. Students will determine relationships among force, mass, and motion.

- a. Calculate velocity and acceleration.
- c. Calculate amounts of work and mechanical advantage using simple machines

MM2P1. Students will solve problems (using the appropriate technology).

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.

QUALITY CONTROL

ACCT-MOII-6. Students will judge lathe and milling machine parts to determine the quality of the parts.

- a. Develop an inspection plan.
- b. Select required measuring instruments.
- c. Inspect a part produced on a lathe.
- d. Inspect a part produced on a milling machine.
- e. Complete a written inspection report to include a decision to accept or reject the part.
- f. Describe inspection procedures, results, and decisions.

Academic standards:

MM4P1. Students will solve problems (using the appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- c. Apply and adapt a variety of appropriate strategies to solve problems.

Implementation date
Fall 2010

MACHINERY MAINTENANCE

ACCT-MOII-7. Students will demonstrate the ability to perform preventive maintenance on the lathe and milling machine.

- a. Perform incidental and preventative maintenance on a lathe and a milling machine.
- b. Report problems that are beyond the scope of authority.
- c. Fill out the history form for tracking maintenance.

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal learning. Students encounter a variety of informational as well as fictional texts, and they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in *context*.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

Reading in All Curriculum Areas

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
- Read both informational and fictional texts in a variety of genres and modes of discourse.
- Read technical texts related to various subject areas.

Discussing Books

Implementation date

Fall 2010

- Discuss messages and themes from books in all subject areas.
- Respond to a variety of texts in multiple modes of discourse.
- Relate messages and themes from one subject area to messages and themes in another area.
- Evaluate the merit of texts in every subject discipline.
- Examine author's purpose in writing.
- Recognize the features of disciplinary texts.

Building Vocabulary Knowledge

- Demonstrate an understanding of contextual vocabulary in various subjects.
- Use content vocabulary in writing and speaking.
- Explore understanding of new words found in subject area texts.

Establishing Context

- Explore life experiences related to subject area content.
- Discuss in both writing and speaking how certain words are subject area related.
- Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

Implementation date

Fall 2010

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

Implementation date
Fall 2010

PROGRAM CONCENTRATION: **Architecture, Construction,
Communications & Transportation**
CAREER PATHWAY: **METALS TECHNOLOGY**
COURSE TITLE: **Sheet Metal I**
PREREQUISITE: **Introduction to Metals**

COURSE DESCRIPTION: This course is designed to allow students to master basic sheet metal techniques. This course includes the development of skills in basic trade math. Students will identify, rate, select, and use steel and other metals to develop and fabricate basic sheet metal projects. The course includes basic parallel line development and skills using fasteners, hangers, and other support systems. Minimum performance requirements for this course are based on successful student completion according to the National Center for Construction Education and Research Center (NCCER) Occupation Standards. Students who successfully complete the course in accordance with NCCER standards are eligible for registration with the NCCER Craft Worker Registry.

INTRO TO PARALLEL LINE DEVELOPMENT

ACCT-SMI-1 Students will demonstrate proficiency in parallel line development.

- a. Demonstrate an understanding of parallel line development as one of the three development methods for laying out sheet metal patterns.
- b. Demonstrate competency in parallel line development layout procedures.
- c. Demonstrate how to lay out patterns utilizing basic parallel line development.

Academic Standards:

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

- a. Determine the distance between two points.
- b. Determine the distance between a point and a line.
- c. Determine the midpoint of a segment.
- d. Understand the distance formula as an application of the Pythagorean theorem.
- e. Use the coordinate plane to investigate properties of and verify conjecture related to triangles and quadrilaterals.

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

- a. Determine the sum of interior and exterior angles in a polygon.
- b. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.
- c. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).

Implementation date
Fall 2010

- d. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.
- e. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

MM2G1. Students will identify and use special right triangles.

- a. Determine the lengths of sides of 30° - 60° - 90° triangles.
- b. Determine the lengths of sides of 45° - 45° - 90° triangles.

MM2G3. Students will understand the properties of circles.

- a. Understand and use properties of chords, tangents, and secants as an application of triangle similarity.
- b. Understand and use properties of central, inscribed, and related angles.
- c. Use the properties of circles to solve problems involving the length of an arc and the area of a sector.
- d. Justify measurements and relationships in circles using geometric and algebraic properties.

MM2G4. Students will find and compare the measures of spheres.

- a. Use and apply surface area and volume of a sphere.
- b. Determine the effect on surface area and volume of changing the radius or diameter of a sphere.

MATH APPLICATIONS I

ACCT-SMI-2 Students will compute and solve mathematically, problems in sheet metal.

- a. Convert denominate numbers and multiply and divide them.
- b. Calculate successfully using various rule measurements.
- c. Calculate successfully using appropriate linear, square, weight, and volume measurements.
- d. Construct simple geometric figures and solve basic geometry problems that relate to the sheet metal trade.

Academic Standards:

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

- f. Determine the distance between two points.
- g. Determine the distance between a point and a line.
- h. Determine the midpoint of a segment.
- i. Understand the distance formula as an application of the Pythagorean theorem.
- j. Use the coordinate plane to investigate properties of and verify conjecture

Implementation date
Fall 2010

related to triangles and quadrilaterals.

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

- f. Determine the sum of interior and exterior angles in a polygon.
- g. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.
- h. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).
- i. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.
- j. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

MM2G1. Students will identify and use special right triangles.

- c. Determine the lengths of sides of 30° - 60° - 90° triangles.
- d. Determine the lengths of sides of 45° - 45° - 90° triangles.

MM2G3. Students will understand the properties of circles.

- e. Understand and use properties of chords, tangents, and secants as an application of triangle similarity.
- f. Understand and use properties of central, inscribed, and related angles.
- g. Use the properties of circles to solve problems involving the length of an arc and the area of a sector.
- h. Justify measurements and relationships in circles using geometric and algebraic properties.

MM2G4. Students will find and compare the measures of spheres.

- c. Use and apply surface area and volume of a sphere.
- d. Determine the effect on surface area and volume of changing the radius or diameter of a sphere.

FASTENERS, HANGERS, AND SUPPORTS

ACCT-SMI-3 Students will demonstrate the ability to use and identify fasteners, hangers, and supports.

- a. Identify the various kinds of fasteners used in sheet metal work.
- b. Use the right fasteners for the right job.
- c. Identify the various aspects of screw and bolt configurations.
- d. Describe some of the more common methods of supporting ducts.
- e. Identify the materials used for hanging and supporting ducts.

Implementation date
Fall 2010

- f. Identify the factors that pertain to the selection and use of hangers and supports.
- g. Demonstrate skill in the installation of duct fasteners, hangers, and supports.

STEEL AND OTHER METALS

ACCT-SMI-4 Students will demonstrate the ability to identify and measure different types of metals used in sheet metal.

- a. State the difference between a pure metal and an alloy.
- b. List the eleven common properties of metals.
- c. State the chief types of metals.
- d. Measure the gage of sheet metal.

Academic Standards:

SPS4. Students will investigate the arrangement of the Periodic Table.

- a. Determine the trends of the following:
 - Location of metals, nonmetals, and metalloids
- b. Use the Periodic Table to predict the above properties for representative elements.

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits

Implementation date

Fall 2010

for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

- a. Reading in all curriculum areas
 - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
 - Read both informational and fictional texts in a variety of genres and modes of discourse.
 - Read technical texts related to various subject areas.
- b. Discussing books
 - Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.
 - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
 - Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.
 - Explore understanding of new words found in subject area texts.
- d. Establishing context
 - Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.
 - Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

Implementation date

Fall 2010

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

Implementation date
Fall 2010

PROGRAM CONCENTRATION: **Architecture, Construction,
Communications & Transportation**
CAREER PATHWAY: **METALS TECHNOLOGY**
COURSE TITLE: **Sheet Metal II**
PREREQUISITE: **Sheet Metal I**

COURSE DESCRIPTION: This course is designed to allow students to master basic sheet metal techniques by developing and fabricating basic sheet metal projects from blueprints and specifications and advanced parallel line development. Minimum performance requirements for this course are based on successful student completion according to the National Center for Construction Education and Research (NCCER) Occupation Standards. Students who successfully complete the course in accordance with the NCCER standards are eligible for registration with the NCCER National Craft Worker Registry.

ADVANCED PARALLEL LINE DEVELOPMENT

ACCT-SMII-1 Students will demonstrate proficiency in advanced parallel line development.

- a. Demonstrate an understanding of parallel line development as a method for fabricating sheet metal fittings and other items.
- b. Demonstrate the proper cutting and forming of basic patterns utilizing parallel line development.
- c. Correctly fabricate selected duct run fittings.

Academic Standards:

MM1G1. Students will investigate properties of geometric figures in the coordinate plane.

- a. Determine the distance between two points.
- b. Determine the distance between a point and a line.
- c. Determine the midpoint of a segment.
- d. Understand the distance formula as an application of the Pythagorean theorem.
- e. Use the coordinate plane to investigate properties of and verify conjecture related to triangles and quadrilaterals.

MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.

- a. Determine the sum of interior and exterior angles in a polygon.
- b. Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.

Implementation date
Fall 2010

- c. Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).
- d. Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.
- e. Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.

MM2G1. Students will identify and use special right triangles.

- a. Determine the lengths of sides of 30° - 60° - 90° triangles.
- b. Determine the lengths of sides of 45° - 45° - 90° triangles.

MM2G3. Students will understand the properties of circles.

- a. Understand and use properties of chords, tangents, and secants as an application of triangle similarity.
- b. Understand and use properties of central, inscribed, and related angles.
- c. Use the properties of circles to solve problems involving the length of an arc and the area of a sector.
- d. Justify measurements and relationships in circles using geometric and algebraic properties.

MM2G4. Students will find and compare the measures of spheres.

- a. Use and apply surface area and volume of a sphere.
- b. Determine the effect on surface area and volume of changing the radius or diameter of a sphere.

BLUEPRINTS AND SPECIFICATIONS

ACCT-SMII-2 Students will demonstrate the ability to interpret blueprints and specifications.

- a. Demonstrate an ability to interpret blueprints and specifications.
- b. Demonstrate an ability to use section, elevation, and detail views or plans for interpreting drawings and blueprints.
- c. Demonstrate an ability to use mechanical, electrical, and plumbing drawings to interpret architectural information.
- d. Demonstrate an ability to use specifications for information pertaining to specific portions of the construction job.

BASIC PIPING PRACTICES

ACCT-SMI-3 Students will demonstrate the ability to identify and use various materials in basic piping.

Implementation date

Fall 2010

- a. State the various materials for which pipe is made.
- b. List applications of various materials.
- c. List the common methods employed for joining pipe.
- d. List the common types of pipe hangers and supports

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

- a. Reading in all curriculum areas
 - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
 - Read both informational and fictional texts in a variety of genres and modes of discourse.
 - Read technical texts related to various subject areas.
- b. Discussing books
 - Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.
 - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
 - Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.

Implementation date
Fall 2010

- Explore understanding of new words found in subject area texts.
- d. Establishing context
 - Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.
 - Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

Implementation date

Fall 2010

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

Implementation date

Fall 2010

PROGRAM CONCENTRATION:

**Architecture, Construction,
Communications & Transportation**

CAREER PATHWAY:

METALS TECHNOLOGY

COURSE TITLE:

Welding I

PREREQUISITE:

Introduction of Metals

COURSE DESCRIPTION: This course is designed to provide all students with the basic knowledge and safe operating skills needed to demonstrate proper set of equipment in oxyfuel and shielded metal arc welding (SMAW). In oxy-fuel area of study students will create accurate cuts and perform washing and gouging procedures. Students will learn to critique their work pieces by welding codes, identifying imperfections, common test methods, and evaluate setups to determine proper setup of work and equipment. In SMAW students will learn and model proper safety and learn to make judgment calls in selection of electrodes and metal preparation to create beads and fillet welds using various rods. Minimum performance requirements for this course are based on successful student completion according to the American Welding Society (AWS) and the National Center for Construction Education and Research Center (NCCER) Occupation Standards. Students who successfully complete the course in accordance with NCCER standards are eligible for registration with the NCCER National Craft Worker Registry.

CAREERS, WORK ETHICS AND HISTORY OF SMAW AND OXYFUEL WELDING PROCEDURES.

Students will explore different types of careers that are available in the welding industry and list careers they judge as meaningful. Evaluate their own skill level and determine skills needed to reach career choices through research. Students will learn the importance of good work ethics in the workplace and model that behavior. Students will learn the history of SMAW and Oxyfuel welding comparing techniques of the past to modern day techniques and equipment.

Implementation date
Fall 2010

OXYFUEL CUTTING/WELDING

ACCT-WI-1. Students will be able to identify and use oxy-fuel cutting/welding equipment.

- a. Identify and explain the use of oxyfuel cutting equipment.
- b. Set up oxyfuel equipment.
- c. Light and adjust an oxyfuel torch.
- d. Disassemble oxyfuel equipment.
- e. Perform advanced oxyfuel cutting techniques:
 - Straight line and square shapes
 - Piercing and slot cutting
 - Bevels
 - Washing
 - Gouging
- f. Operate a motorized, portable oxyfuel cutting machine.

Academic Standards:

MM4P3. Students will solve problems (using appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

MM3P5. Students will communicate mathematically.

- a. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
- c. Analyze and evaluate the mathematical thinking and strategies of others.
- d. Use the language of mathematics to express mathematical ideas precisely.

WELDING PROCEDURES

ACCT-WI-2. Students will demonstrate understanding of the importance of welding procedures and how to critique their work.

- a. Identify and explain codes governing welding.
- b. Identify and explain weld imperfections and their causes.
- c. Identify and explain nondestructive examination processes.
- d. Identify common destructive testing methods.
- e. Identify and explain welder qualification tests.
- f. Explain the importance of quality workmanship.

Implementation date
Fall 2010

Academic Standards:

SCSh3. Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- b. Develop procedures for solving scientific problems.
- c. Collect, organize and record appropriate data.

SMAW

ACCT-WI-3. Students will learn and model proper safety for SMAW and make meaning of the welding codes, metallurgy, metal preparation, demonstrating their ability to evaluate factors to determine electrode required.

- a. Identify and explain shielded metal arc welding (SMAW) safety.
- b. Identify and explain welding electrical equipment.
- c. Identify and explain arc welding machines.
- d. Explain setting up arc welding equipment.
- e. Set up a machine for welding.
- f. Identify and explain tools for weld cleaning.
- g. Identify factors that affect electrode selection.
- h. Explain the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME) filler metal classification system.
- i. Identify different types of filler metals.
- j. Explain filler metal traceability requirements and how to use applicable code requirements.
- k. Identify and select the proper electrode for an intended welding task.

Academic Standards:

SPS4. Students will investigate the arrangement of the Periodic Table

- a. Determine the trends of the following:
Location of metals, nonmetals, and metalloids
- b. Use the Periodic Table to predict the above properties for representative elements.

Implementation date
Fall 2010

SMAW

ACCT-WI-4. Students will make stringer beads and/or padding using the Shielded Metal Arc Welding (SMAW) process to the instructor's discretion and satisfaction in the flat position using E-6013, E-6010 or E-7018 electrodes.

- a. Demonstrate a working knowledge of the equipment and the safe operation of the equipment.
- b. Demonstrate knowledge of the equipment needed to perform this task.
- c. Demonstrate proper weld procedures by producing welds in the flat position using E-6013, E-6010 or E-7018 electrodes.

Academic Standards:

MM4P3. Students will solve problems (using appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

MM3P5. Students will communicate mathematically.

- a. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
- c. Analyze and evaluate the mathematical thinking and strategies of others.
- d. Use the language of mathematics to express mathematical ideas precisely.

SMAW

ACCT-WI-5. Students will make fillet welds using the Shielded Metal Arc Welding (SMAW) process to the instructor's discretion and satisfaction in the flat (1F) and/or horizontal (2F) positions using E-6013, E-6010 or E-7018 electrodes.

- a. Demonstrate a working knowledge of the equipment and the safe operation of the equipment.
- b. Demonstrate knowledge of the equipment needed to perform this task.

Implementation date

Fall 2010

- c. Demonstrate proper weld procedures by producing single and multiple pass fillet welds in the flat or horizontal position on a variety of joints using E-6013, E-6010 and/or E-7018 electrodes.

Academic Standards:

MM4P3. Students will solve problems (using appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

MM3P5. Students will communicate mathematically.

- a. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
- c. Analyze and evaluate the mathematical thinking and strategies of others.
- d. Use the language of mathematics to express mathematical ideas precisely.

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Implementation date
Fall 2010

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

- a. Reading in all curriculum areas
 - Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
 - Read both informational and fictional texts in a variety of genres and modes of discourse.
 - Read technical texts related to various subject areas.
- b. Discussing books
 - Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.
 - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
 - Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.
 - Explore understanding of new words found in subject area texts.
- d. Establishing context
 - Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.
 - Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education

Implementation date

Fall 2010

Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

Implementation date
Fall 2010

Implementation date

Fall 2010

PROGRAM CONCENTRATION:

**Architecture, Construction,
Communications & Transportation**

CAREER PATHWAY:

METALS TECHNOLOGY

COURSE TITLE:

Welding II

PREREQUISITE:

Welding I

COURSE DESCRIPTION: This course is designed to provide all students with the basic knowledge and safe operating skills required to perform industry entry-level skills in the use of shielded metal arc welding equipment (SMAW) and an introduction to gas metal arc welding (GMAW) setup and operations. In SMAW welding students will produce welds using 6010 and 7018 electrodes in the flat (1F), horizontal (2F), and vertical (3F) fillet welds using the procedure in the flat, vertical, and horizontal positions using E-6010 and E-7018 electrodes. In GMAW welding students will produce fillet welds in the flat (1F) position. Minimum performance requirements for this course are based on successful student completion according to the American Welding Society (AWS) and the National Center for Construction Education and Research Center (NCCER) Occupation Standards. Students who successfully complete the course in accordance with NCCER standards are eligible for registration with the NCCER National Craft Worker Registry.

CAREERS, WORK ETHICS AND HISTORY OF SMAW AND GMAW WELDING PROCEDURES.

Students will explore different types of careers that are available in the welding industry and list careers they judge as meaningful. Evaluate their own skill level and determine skills needed to reach career choices through research. Students will learn the importance of good work ethics in the workplace and model that behavior. Students will learn the history of SMAW and GMAW welding, comparing techniques of the past to modern day techniques and equipment.

SMAW

ACCT-WII-1. Students will make fillet welds using the Shielded Metal Arc Welding (SMAW) process to the instructor's discretion and satisfaction in the horizontal (2F) positions using E-6010 and/or E-7018 electrodes.

- a. Demonstrate a working knowledge of the equipment and the safe operation of the equipment.
- b. Demonstrate knowledge of the equipment needed to perform this task.
- c. Demonstrate knowledge of the equipment by evaluating equipment setup and making judgments as to settings to create fillet welds in the horizontal (2F) position on a variety of joints using E-6010 and/or E-7018 electrodes.

Implementation date
Fall 2010

Academic Standards:

MM4P1. Students will solve problems (using appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

SCSh3. Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- b. Develop procedures for solving scientific problems.
- d. Collect, organize and record appropriate data.

SMAW

ACCT-WII-2. Students will make fillet welds using the Shielded Metal Arc Welding (SMAW) process to the instructor's discretion and satisfaction in the Vertical (3F) positions using E-6010 and/or E-7018 electrodes.

- a. Demonstrate a working knowledge of the equipment and the safe operation of the equipment.
- b. Demonstrate knowledge of the equipment needed to perform this task.
- c. Demonstrate knowledge of the equipment by evaluating equipment setup and making judgments as to settings to create single and multiple pass fillet welds in the vertical position on a variety of joints using E-6010 and/or E-7018 electrodes.

Academic Standards:

MM4P1. Students will solve problems (using appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

SCSh3. Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- b. Develop procedures for solving scientific problems.
- c. Collect, organize and record appropriate data.

GMAW

ACCT-WII-3. Students will demonstrate understanding of the Gas Metal Arc Welding (GMAW) process.

- a. Identify the parts of a GMAW welding machine.

Implementation date
Fall 2010

- b. Demonstrate knowledge of the equipment and its safe operation.
- c. Demonstrate a knowledge of the different types of gases to be used in the GMAW welding process including 75/25, CO₂, 95/5 and Tri-Mix and make judgments as to what gas is used in different applications.
- d. Run beads and create fillet welds using the GMAW process in the flat position.

Academic Standards:

MM4P1. Students will solve problems (using appropriate technology)

- a. Build new mathematical knowledge through problem solving.
- b. Solve problems that arise in mathematics and in other contexts.
- c. Apply and adapt a variety of appropriate strategies to solve problems.
- d. Monitor and reflect on the process of mathematical problem solving.

SCSh2. Students will use standard safety practices for all classroom laboratory and field investigations.

- a. Follow correct procedures for use of scientific apparatus.
- b. Demonstrate appropriate techniques in all laboratory situations.
- c. Follow correct protocol for identifying and reporting safety problems and violations.

Reading Across the Curriculum

Reading Standard Comment

After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts, mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in context.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:

- a. Reading in all curriculum areas

Implementation date
Fall 2010

- Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
 - Read both informational and fictional texts in a variety of genres and modes of discourse.
 - Read technical texts related to various subject areas.
- b. Discussing books
- Discuss messages and themes from books in all subject areas.
 - Respond to a variety of texts in multiple modes of discourse.
 - Relate messages and themes from one subject area to messages and themes in another area.
 - Evaluate the merit of texts in every subject discipline.
 - Examine author's purpose in writing.
 - Recognize the features of disciplinary texts.
- c. Building vocabulary knowledge
- Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.
 - Explore understanding of new words found in subject area texts.
- d. Establishing context
- Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.
 - Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

Implementation date
Fall 2010

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.