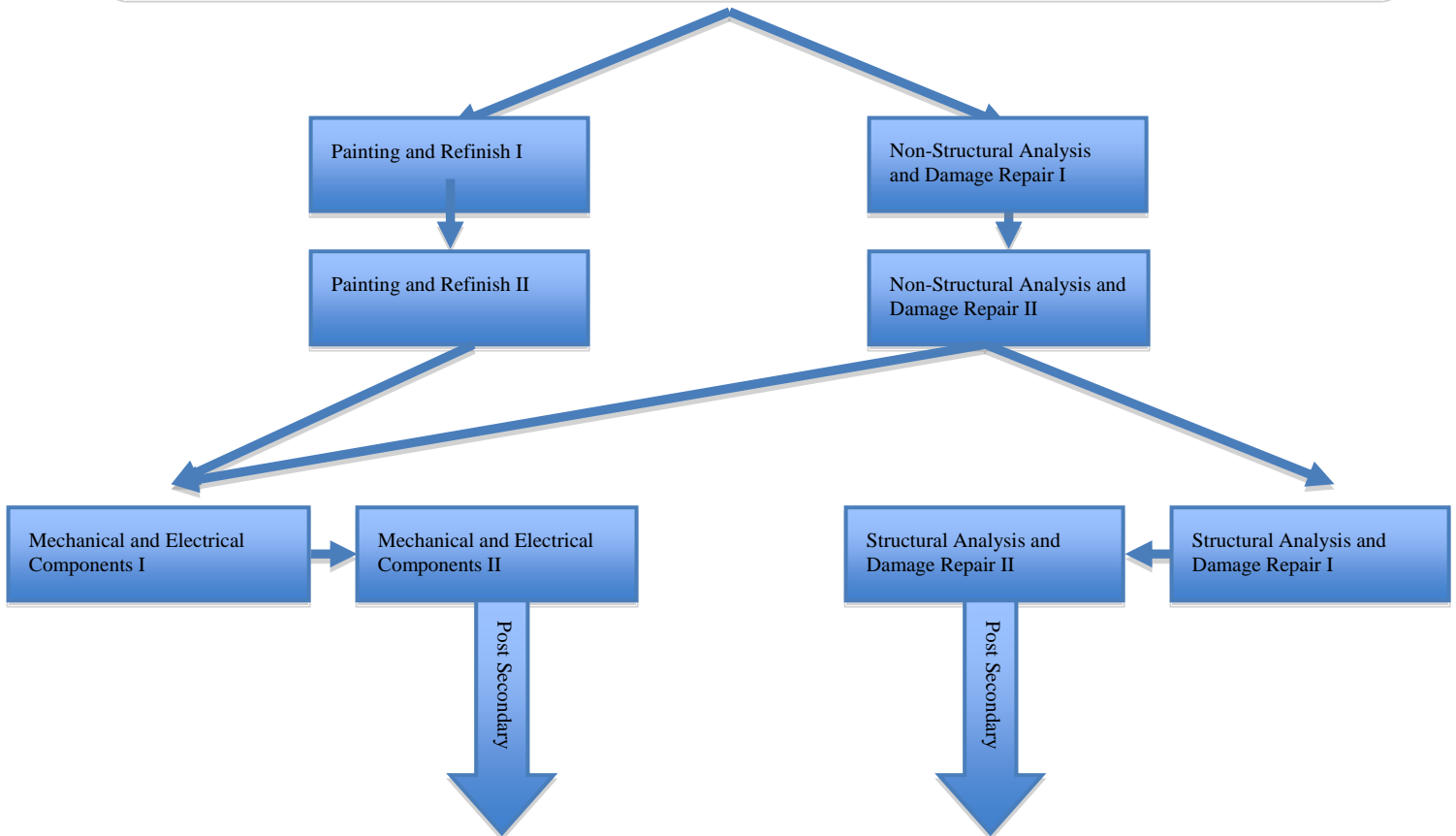


The Collision Repair Pathway Map

Introduction to Collision Repair and Refinish



Apprenticeship:

Technical college:

- Painting and Refinishing, Non Structural Analysis and Damage Repair, Structural Analysis and Damage Repair, Mechanical and Electrical Components.

Possible career fields:

Paint Apprentice, Paint Tech, Apprentice Body Tech, Body Tech, Apprentice Frame Tech, Frame Tech, Mechanical and Electrical Specialist, Insurance Adjuster, Estimate Writer, Body Shop Manager, Body Shop Owner.

This Collision Repair Pathway is designed to prepare a student with foundational knowledge and skills for a career in the collision repair field. As the student progresses through the Pathway they are given the opportunity to explore two craft areas on an introductory level. Once they have completed the introductory course they are then given the option to “major” in at least one of two craft areas. These areas emphasize Painting and Refinishing or Non-Structural Analysis and Repair. Successful completion of this Pathway includes three units consisting of Introduction to Collision and Repair; and Levels I and II within one craft area.

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PROGRAM CONCENTRATION: Architecture, Construction,
Communications & Transportation
CAREER PATHWAY: Collision Repair
COURSE TITLE: Introduction to Collision Repair

Course Description:

Introduction to collision repair is the prerequisite to all other courses in the collision repair pathway. Employment opportunities in the collision repair field will be explored. In this course the student will be exposed to all areas of collision repair and automotive refinish such as safety, refinishing, metal repair, plastic repair, automotive construction, and estimate reading and writing. Basic skills in all of the above mentioned areas will be taught.

ACCT-ICR-1. Safety---Students will comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power tools; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and environmental regulations. For every task in painting and refinishing these safety requirements must be strictly enforced.

- a. Identify and take necessary precautions with hazardous operations and materials according to federal state and local regulations.
- b. Identify safety and personal health hazards according to OSHA guidelines and the "Right to know Law".
- c. Inspect spray environments to ensure compliance with federal, state, and local regulations, and for safety and cleanliness hazards.
- d. Select and use the NIOSH approved cartridge respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA regulations.
- e. Select and use the NIOSH approved (fresh air make- up system). Perform proper maintenance in accordance to OSHA regulations.
- f. Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects and detailing (gloves, suits, hoods, eye and ear protection, etc.).

Academic Standard(s):

SEV4- Students will understand and describe availability, allocation and conservation of energy and other resources.

- c. Describe how energy and other resource utilization impact the environment and recognize that individuals as well as larger entities (businesses,

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governments, etc.) have impact on energy efficiency.

- e. Describe the commonly used fuels (e.g. fossil fuels, nuclear fuels, etc.) and some alter technology, availability, pollution problems and implementation problems. Recognize the origin of fossil fuels and the problems associated with our dependence on this energy source.

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

- c. Explain how human activity affect global and local sustainability.
- e. Describe the effects and potential implications of pollution and resource depletion on the environment at the global levels(e.g. air and water pollution, solid waste disposal, depletion of the stratospheric ozone, global warming, and land uses).
- f. Describe how political, legal, social, and economic decisions may affect global and local ecosystems.

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

National Academic Standards (NATEF)

SC007- Analyzes and evaluates environmental issues

SC012- Analyzes / evaluates environmental issues such as waste management.

SC041- Applies and uses laboratory safety techniques.

ACCT-ICR-2 Collision Repair Careers--- Students will explore the different areas of the collision repair industry. The students will learn what skills and knowledge are needed to be successful in each area of collision repair.

- a. Compare each career pathway in the collision repair field.
- b. Research and report on one area of the collision repair field.

Academic Standard(s):

SCSH3- Students will Identify and investigate problems scientifically.

- d. Graphically compare and analyze data points and or summary statistics.
- e. Develop reasonable conclusions based on Data collected.

MM3D3- Students will understand the differences between experimental and observational studies by posing questions and collecting, analyzing, and interpreting data.

National Academic Standards (NATEF)

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MA229- Solves problems generates conclusions.

SC041- Applies and uses laboratory safety techniques.

SC044- Applies and uses scientific method.

ACCT-ICR-3 Tools and Equipment--- Students will identify and correctly use power tools and hand tools used in collision repair.

- a. Identify, use, and maintain common hand tools in the collision repair shop.
- b. Identify, use, and maintain common power tools in the collision repair shop.

Academic Standard(s):

MA171- Identifies metric measurements Length/ Volume/Weight.

SC-492- Measures force.

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

- e. Calculate amounts of work and mechanical advantages of using simple machines.

National Academic Standards (NATEF)

SC248- Describes and explains force.

SC041- Applies and uses laboratory safety techniques.

SC044- Applies and uses scientific method.

MA229- Solves problems. Generates conclusions. Demonstrates deductive reasoning.

MA271- Determines proper operation.

MA273- Computes tolerances/ranges mentally.

ACCT-ICR-4 Basic Metal Repair--- Students will learn basic metal repair techniques. They will also be able to distinguish between steel and aluminum.

- a. Distinguish between steel and aluminum.
- b. Demonstrate the ability to rough out a dent In a steel panel with a hammer and dolly.
- c. Demonstrate the ability to metal finish a dent in a steel panel with a hammer and dolly.
- d. Demonstrate the ability to remove a dent from a steel panel with a weld on dent puller.
- e. Demonstrate the ability to mix, apply, and block sand body filler to

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level.

- f. Demonstrate the ability to mix, apply and block sand primer surfacer.
- g. Demonstrate safe work habits at all times and follow all class room safety rules.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SC5- Students will understand that the rate at which a chemical reaction occurs can be affected by changing concentration, temperature, or pressure and the addition of a catalyst.

- g. Demonstrate the effects of changing concentration, temperature, and pressure on chemical reactions.
- h. Investigate the effects of a catalyst on chemical reactions and apply it to everyday examples.

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

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

SPS5- Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.

- a. Compare and contrast the atomic/molecular motion of solids, liquids, gasses and plasmas.
- b. Relate temperature, pressure, and volume of gasses to the behavior of gasses.

MM3P1- 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.

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MM3P3- 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.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- d. Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses tables and graphs.

SC044- Applies and uses scientific method.

SC116- Describes chemical reactions with a catalyst.

SC121- Describes chemical reactions with an inhibitor.

SC213- Describes electro chemical reactions such as Oxidation/reduction.

SC395- Describes and explains solution and solvents.

SC443- Explain relative humidity.

SC492- Measures force.

SC499- Uses computers for information gathering and estimating.

SC513- Describes and explains torque.

MA229- Solves problems. Generates conclusions. Demonstrates deductive reasoning.

MA271- Determines proper operation.

MA273- Computes tolerances/ranges mentally.

MA274- Computes proper operations mentally.

ACCT-ICR-5 Basic Plastic Repair--- Students will be able to identify the most common types of plastic used in automotive construction and be able to perform simple repairs on them.

- a. Distinguish between the common types of plastic.
- b. Properly repair dents gouges and cuts in plastic panels using various methods.
- c. Demonstrate safe work habits at all times and follow all class room safety rules.

Academic Standard(s)

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and

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violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

MM3P1- 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.

MM3P3- Students will communicate mathematically.

- a. Organize and consolidate their mathematical thinking through communication.
- c. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other Disciplines.

- e. Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses tables and graphs.

SC044- Applies and uses scientific method.

SC114- Describes/Explains chemical reactions.

SC116- Describes/Explains chemical reactions catalyst.

ACCT-ICR-6 Automotive Construction--- Students will identify the types of vehicle construction and know the advantages and disadvantages of each.

- a. Students will distinguish between body over frame construction and uni-body Construction.
- b. Students will discuss the advantages and disadvantages of body over fame and uni-body construction.

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- c. Students will identify the parts of each type of vehicle construction.
- d. Students will discuss how each type of vehicle construction reacts in a collision and differences in repair techniques due to type of construction.

Academic Standard(s)

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

- b. Apply Newton's three laws to everyday situations by explaining the following:
 - inertia
 - Relationship between force, mass and acceleration
 - Equal and opposite forces

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

- 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 the process of mathematical problem solving.

MM4P4- Students will make connections among mathematical ideas and to other disciplines.

- c. Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

MA229- Solves problems, generates conclusions, deductive reasoning.

SC044- Applies uses scientific method

ACCT-ICR-7 Automotive Refinish--- Students will Identify and explain the differences in the different type of refinish material used in the automotive refinish industry as well as demonstrating basic spray techniques.

- a. Distinguish the difference in single stage and basecoat clear coat paint systems.
- b. Demonstrate the ability to mix and spray both single stage and basecoat clear coat paint systems.

Academic Standard(s):

SEV4- Students will understand and describe availability, allocation and conservation of energy and other resources.

- c. Describe how energy and other resource utilization impact the

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environment and recognize that individuals as well as larger entities. (businesses, governments, etc.) have impact on energy efficiency.

- e. Describe the commonly used fuels (e.g. fossil fuels, nuclear fuels, etc.) and some alternative fuels(e.g. wind, solar, ethanol, etc.) including the required technology, availability, pollution problems, and implementation.
problems. Recognize the origin of fossil fuels and the problems associated with our dependence on this energy source.

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

- c. Explain how human activity affect global and local sustainability.
- 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).
- f. Describe how political, legal, social, and economic decisions may affect global and local ecosystems.

SCSH4- Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

- a. Develop and use systematic procedures for recording and organizing information.
- b. Use technology to produce tables and graphs.
- c. Use technology to develop, test, and revise experimental or mathematical models.

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SC5- Students will understand that the rate at which a chemical reaction occurs can be affected by changing concentration, temperature, or pressure and the addition of a catalyst.

- a. Demonstrate the effects of changing concentration, temperature,

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and pressure on chemical reactions.

- b. Investigate the effects of a catalyst on chemical reactions and apply it to everyday examples.

SPS9- Students will investigate the properties of waves.

- a. Recognize that all waves transfer energy.
- d. Investigate the phenomena of reflection, refraction, interference, and diffraction.

MM3P1- 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.

MM3P3- 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.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- c. Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

SC012- Analyzes / evaluates environmental issues such as waste management.

SC042- Applies and uses maps, charts, tables, and graphs.

SC044- Applies and uses the scientific method.

SC114- Describes and explains chemical reactions.

SC116- Describes chemical reactions with a catalyst.

SC121- Describes chemical reactions with an inhibitor.

SC321- Describes and explains light angle of incidence and reflection.

SC329- Describes and explains light (opaque).

SC335- Describes and explains light (translucent & transparent).

SC443- Explain relative humidity.

SC497- Measures volume of liquids and solids.

SC499- Uses computers for processing and estimating information.

SC512- Describes and explains how contamination effects chemical reactions.

SC522- Applies and uses ratio and proportion mixtures.

SC531- Describes and explains viscosity.

SC532- Describe and explain light sources.

MA028- Computes addition mentally.

MA126- Converts units from English to metric and metric to English.

MA161- Identifies English measurement: length / volume / weight.

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MA171- Identifies Metric measurement: length / volume / weight.

MA182- Measures direct temperature.

MA184- Measures direct volume.

MA229- Solves problems. Generates conclusions. Demonstrates deductive Reasoning.

ACCT-ICR-8 Estimate reading and writing--- Students will be able to read and write both simple hand written and computer generated estimates.

- a. Demonstrate the process of information gathering.
- b. Demonstrate the process of Inspection.
- c. Process the inspection results with known information and formulate a repair estimate.

Academic Standard(s):

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SCSH5- Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

- c. Recognize the relationship between accuracy and precision.

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

- 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 the process of mathematical problem solving.

MM4P4- Students will make connections among mathematical ideas and to other disciplines.

- c. Recognize and apply mathematics in contexts outside of mathematics.

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MA026- Computes addition decimals.

MA034- Computes addition whole numbers.

MA039- Computes division of decimals.

MA047- Computes division of whole numbers.

MA065- Computes multiplication of decimals.

MA073- Computes multiplication of whole numbers.

MA084- Computes subtraction of decimals.

MA092- Computes subtraction of whole numbers.

MA229- Solves problems, Generates conclusions.

SC012- Analyzes / evaluates environmental issues such as waste management.

SC042- Applies and uses maps, charts, tables, and graphs.

SC044- Applies and uses the scientific method.

SC499- Uses computers for information processing.

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.

Students will enhance reading in all curriculum areas by:

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- 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,

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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

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successful entrepreneurial performance.

PROGRAM CONCENTRATION:	Architecture, Construction, Communications & Transportation
CAREER PATHWAY:	Collision Repair
COURSE TITLE:	Painting and Refinishing I
PREREQUISITE:	Introduction to Collision Repair

Course Description: Painting and Refinishing I is the first course in the painting and refinishing strand of the collision repair that will teach the student skills and knowledge that will help him or her obtain a career in the automotive refinish industry. The student will learn theory, as well as hands on application in a project based setting. This training will give successful completers basic skills and knowledge to obtain an entry level job in the automotive refinish field.

Safety Precautions

ACCT-PRI-1. Safety---Students will comply with personal and environmental safety practices associated with clothing and the use of gloves; respiratory protection; eye protection; hand tools; power tools; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and environmental regulations. For every task in painting and refinishing these safety requirements must be strictly enforced.

- g. Identify and take necessary precautions with hazardous operations and materials according to federal state and local regulations.
- h. Identify safety and personal health hazards according to OSHA guidelines and the "Right to know Law".
- i. Inspect spray environments to ensure compliance with federal, state, and local regulations, and for safety and cleanliness hazards.
- j. Select and use the NIOSH approved cartridge respirator. Inspect condition and ensure fit and operation. Perform proper maintenance in accordance with OSHA regulations.
- k. Select and use the NIOSH approved (fresh air make- up system). Perform proper maintenance in accordance to OSHA regulations.
- l. Select and use the proper personal safety equipment for surface preparation, spray gun and related equipment operation, paint mixing, matching and application, paint defects and detailing (gloves, suits, hoods, eye and ear protection, etc.).

Academic Standard(s):

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SEV4- Students will understand and describe availability, allocation and conservation of energy and other resources.

- c. Describe how energy and other resource utilization impact the environment and recognize that individuals as well as larger entities (businesses, governments, etc.) have impact on energy efficiency.
- e. Describe the commonly used fuels (e.g. fossil fuels, nuclear fuels, etc.) and some alter technology, availability, pollution problems and implementation problems. Recognize the origin of fossil fuels and the problems associated with our dependence on this energy source.

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

- c. Explain how human activity affect global and local sustainability.
- e. Describe the effects and potential implications of pollution and resource depletion on the environment at the global levels(e.g. air and water pollution, solid waste disposal, depletion of the stratospheric ozone, global warming, and land uses).
- f. Describe how political, legal, social, and economic decisions may affect global and local ecosystems.

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

National Academic Standards (NATEF)

SC007- Analyzes and evaluates environmental issues

SC012- Analyzes / evaluates environmental issues such as waste management.

SC041- Applies and uses laboratory safety techniques.

ACCT-PRI-2. Surface prep---Students will be able to properly prepare a surface to be refinished. This will include trim removal, mechanical and chemical removal of worn refinish material, proper application of undercoats and cleaning of the surface before top coat application.

- a. Inspect, remove, store, and replace exterior trim and components necessary for proper surface preparation.
- b. Soap and water wash the entire vehicle; use appropriate cleaner to remove contaminates.

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- c. Inspect and identify substrate, type of finish, surface condition, and film thickness: develop and document a plan for refinishing using a total product system.
- d. Remove paint finish.
- e. Dry or wet sand areas to be refinished.
- f. Featheredge damaged areas to be refinished.
- g. Apply suitable metal treatment or primer in accordance with paint system you are using.
- h. Mask and protect all other areas that are not being refinished.
- i. Mix primer, primer surfacer, or primer sealer.
- j. Apply primer onto surface of repaired area.
- k. Apply two component finishing filler to minor surface imperfections.
- l. Dry or wet sand area to which primer-surfacer has been applied.
- m. Dry sand area where two component filler has been applied.
- n. Remove dust from area to be refinished, including cracks or moldings of adjacent areas.
- o. Clean areas to be refinished with a final cleaning solution.
- p. Remove dust or lint particles on a surface to be refinished by using a tack rag.
- q. Apply suitable sealer to area being refinished when sealer is either needed or desirable.
- r. Scuff sand to remove nibs or imperfections from a sealer.
- s. Apply stone chip resistant coating.
- t. Restore corrosion resistant coatings, caulking, and seam sealer to repaired areas.
- u. Prepare adjacent panels for blending.
- v. Identify the types of plastic to be refinished; determine the materials, preparation, and refinishing procedures.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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SC5- Students will understand that the rate at which a chemical reaction occurs can be affected by changing concentration, temperature, or pressure and the addition of a catalyst.

- a. Demonstrate the effects of changing concentration, temperature, and pressure on chemical reactions.
- b. Investigate the effects of a catalyst on chemical reactions and apply it to everyday examples.

MM3P1- Students will solve problems (using appropriate technology)

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

MM3P3- Students will communicate mathematically.

- b. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other Disciplines.

- i. Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

SC042- Applies and uses maps, charts, tables, and graphs.

SC044- Applies and uses the scientific method.

SC114- Describes and explains chemical reactions.

SC116- Describes chemical reactions with a catalyst.

SC121- Describes chemical reactions with an inhibitor.

SC213- Describes electro chemical reactions such as oxidation/reduction

SC395- Describes and explains solution and solvents.

SC443- Explain relative humidity.

SC497- Measures volume of liquids and solids.

SC499- Uses computers for processing and estimating information.

SC512- Describes and explains how contamination effects chemical reactions.

SC522- Applies and uses ratio and proportion mixtures.

SC531- Describes and explains viscosity.

MA028- Computes addition mentally.

MA126- Converts units from English to metric and metric to English.

MA161- Identifies English measurement: length / volume / weight.

MA171- Identifies Metric measurement: length / volume / weight.

MA182- Measures direct temperature.

MA184- Measures direct volume.

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MA229- Solves problems. Generates conclusions. Demonstrates deductive Reasoning.

ACCT-PRI-3 Spray gun Operation and maintenance--- Students will know all the parts off a paint gun and be able to disassemble and reassemble a paint gun after cleaning. Students will be able to inspect and replace worn or broken parts of a paint gun.

- a. Inspect clean and determine condition of spray guns and related equipment (air hoses, regulators, air lines, air source and spray environment).
- b. Check and adjust spray gun operation for HVLP or LVHP guns.
- c. Set-up, adjust, and test spray gun using fluid, air, and pattern control valves.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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

- e. Calculates amount of work and mechanical advantage using simple machines.

National Academic Standards (NATEF)

SC042- Applies and uses maps, charts, tables, and graphs.

SC255- Describes and explains force and pressure.

SC494- Measures pressure.

SC497- Measures volume of liquids and solids.

SC504- Describes and explains fluid systems (pneumatics).

SC520- Measures flow rate.

SC521- Describes and explains flow rate.

Reading Across the Curriculum

Reading Standard Comment

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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.

Students will enhance reading in all curriculum areas by:

- c. 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.
- d. 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.
- e. Building vocabulary knowledge
 - Demonstrate an understanding of contextual vocabulary in various subjects.
 - Use content vocabulary in writing and speaking.

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- Explore understanding of new words found in subject area texts.
- f. 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,

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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.

PROGRAM CONCENTRATION:	Architecture, Construction, Communications & Transportation
CAREER PATHWAY:	Collision Repair
COURSE TITLE:	Painting and Refinishing II
PREREQUISITE:	Painting and Refinishing I

Course Description: Painting and Refinishing II is the second course in painting and refinishing strand of the collision repair pathway that will teach the student skills and knowledge that will help him or her obtain a career in the automotive refinish industry. The student will learn theory, as well as hands on application in a project based setting. This training will give successful completers basic skills and knowledge to obtain an entry level job in the automotive refinish field.

ACCT-PRII- 1. Paint Mixing, Matching, and Applying--- Students will be able to mix and apply refinish material according to the paint manufacturer's

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instructions. Students will also learn basic color theory and how to tint paint for the best possible match.

- a. Determine type and color of paint already on the vehicle by manufacturer's vehicle information label.
- b. Shake, stir, reduce, catalyze/activate, and strain paint
- c. Apply various refinish materials using appropriate spray techniques(gun arc, gun angle, gun distance, gun speed and spray pattern overlap) for the finish being applied.
- d. Apply selected product on a test and let down panels: check for color match.
- e. Apply single stage topcoat.
- f. Apply basecoat/clearcoat for panel blending or partial refinishing.
- g. Apply basecoat/clearcoat for overall refinishing.
- h. Refinish rigid and semi-rigid plastic parts.
- i. Apply multi stage coats for panel blending or overall refinishing.
- j. Identify and mix paint using a formula.
- k. Identify poor hiding colors; determine necessary action.
- l. Tint color using formula to achieve a blendable match.
- m. Identify alternative color formula to achieve a blendable match.

Academic Standard(s):

SEV4- Students will understand and describe availability, allocation and conservation of energy and other resources.

- c. Describe how energy and other resource utilization impact the environment and recognize that individuals as well as larger entities. (businesses, governments, etc.) have impact on energy efficiency.
- e. Describe the commonly used fuels (e.g. fossil fuels, nuclear fuels, etc.) and some alternative fuels(e.g. wind, solar, ethanol, etc.) including the required technology, availability, pollution problems, and implementation problems. Recognize the origin of fossil fuels and the problems associated with our dependence on this energy source.

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

- c. Explain how human activities affect global and local sustainability.
- 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).
- f. Describe how political, legal, social, and economic decisions may affect global and local ecosystems.

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SCSH4- Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.

- a. Develop and use systematic procedures for recording and organizing information.
- b. Use technology to produce tables and graphs.
- c. Use technology to develop, test, and revise experimental or mathematical models.

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SC5- Students will understand that the rate at which a chemical reaction occurs can be affected by changing concentration, temperature, or pressure and the addition of a catalyst.

- a. Demonstrate the effects of changing concentration, temperature, and pressure on chemical reactions.
- b. Investigate the effects of a catalyst on chemical reactions and apply it to everyday examples.

SPS9- Students will investigate the properties of waves.

- a. Recognize that all waves transfer energy.
- d. Investigate the phenomena of reflection, refraction, interference, and diffraction.

MM3P1- Students will solve problems (using 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.

MM3P3- Students will communicate mathematically.

- b. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other

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disciplines.

- c. Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

- SC012- Analyzes / evaluates environmental issues such as waste management.
- SC042- Applies and uses maps, charts, tables, and graphs.
- SC044- Applies and uses the scientific method.
- SC114- Describes and explains chemical reactions.
- SC116- Describes chemical reactions with a catalyst.
- SC121- Describes chemical reactions with an inhibitor.
- SC321- Describes and explains light angle of incidence and reflection.
- SC329- Describes and explains light (opaque).
- SC335- Describes and explains light (translucent & transparent).
- SC443- Explain relative humidity.
- SC497- Measures volume of liquids and solids.
- SC499- Uses computers for processing and estimating information.
- SC512- Describes and explains how contamination effects chemical reactions.
- SC522- Applies and uses ratio and proportion mixtures.
- SC531- Describes and explains viscosity.
- SC532- Describe and explain light sources.
- MA028- Computes addition mentally.
- MA126- Converts units from English to metric and metric to English.
- MA161- Identifies English measurement: length / volume / weight.
- MA171- Identifies Metric measurement: length / volume / weight.
- MA182- Measures direct temperature.
- MA184- Measures direct volume.
- MA229- Solves problems. Generates conclusions. Demonstrates deductive Reasoning.

ACCT-PRII-2. Paint Defects- Causes and Cures--- Students will be able to identify, determine the cause and correct the condition of many common paint defects.

- a. Identify blistering; determine the cause(s) and correct the condition.
- b. Identify blushing; determine the cause(s) and correct the condition.
- c. Identify a dry spray appearance in the paint surface; determine the cause(s) and correct the condition.
- d. Identify the presence of fish eyes in the finish; determine the cause(s) and correct the condition.
- e. Identify lifting; determine the cause(s) and correct the condition.
- f. Identify clouding; determine the cause(s) and correct the condition.

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- g. Identify orange peel; determine the cause(s) and correct the condition.
- h. Identify overspray; determine the cause(s) and correct the condition.
- i. Identify solvent popping in a freshly painted surface; determine the cause(s) and correct the condition.
- j. Identify sags and runs in a paint surface; determine the cause(s) and correct the condition.
- k. Identify sanding marks; determine the cause(s) and correct the condition.
- l. Identify color difference; determine the cause(s) and correct the condition.
- m. Identify tape tracking; determine the cause(s) and correct the condition.
- n. Identify low gloss condition; determine the cause(s) and correct the condition.
- o. Identify poor adhesion; determine the cause(s) and correct the condition.
- p. Identify paint cracking; determine the cause(s) and correct the condition.
- q. Identify corrosion; determine the cause(s) and correct the condition.
- r. Identify dirt or dust in the paint surface; determine the cause(s) and correct the condition.
- s. Identify water spotting; determine the cause(s) and correct the condition.
- t. Identify finish damage caused by bird droppings, tree sap, and other natural causes; correct the condition.
- u. Identify die-back conditions; determine the cause(s) and correct the condition.
- v. Identify chalking; determine the cause(s) and correct the condition.
- w. Identify bleed through; determine the cause(s) and correct the condition.
- x. Identify pin holing; determine the cause(s) and correct the condition.
- y. Identify buffing related imperfections; correct the problem.
- z. Identify pigment flotation; determine the cause(s) and correct the condition.
- aa. Measure mill thickness.

Academic Standard(s)

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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SC044- Applies and uses the scientific method.

SC052- Converts measurement units from English to Metric.

SC489- Measures distance and length.

ACCT-PRII-3. Final Detail--- Students will be able to final detail a vehicle that will be returned to a customer. The student will be able to select the proper tools and chemicals needed to perform final detailing.

- a. Apply decals, transfers, tapes, woodgrains, pinstripes, etc.
- b. Buff and polish finish to remove defects as required.
- c. Clean exterior, interior and glass.
- d. Clean body openings (door jambs and edges).
- e. Remove overspray.

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- b. Develop procedures for solving scientific problems.
- c. Collect organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

MM3P1- Students will solve problems (using 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.

MM3P3- 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.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- b. Recognize and apply mathematics in contexts outside of mathematics.

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National Academic Standards (NATEF)

- SC044- Applies and uses the scientific method.
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- MA229- Solves problems. Generates conclusions. Demonstrates deductive Reasoning.

Reading Across the Curriculum

Reading Standard Comment

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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.

Students will enhance reading in all curriculum areas by:

- e. Reading in all curriculum areas

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 - Read both informational and fictional texts in a variety of genres and modes of discourse.
 - Read technical texts related to various subject areas.
- f. 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.
- g. 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.
- h. Establishing context
- Explore life experiences related to subject area content.
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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.

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PROGRAM CONCENTRATION: Architecture, Construction,
Communications & Transportation
CAREER PATHWAY: Collision Repair
COURSE TITLE: Non Structural Analysis and Damage Repair I
PREREQUISITE: Introduction to Collision Repair

Course Description: Non Structural Analysis and Damage Repair I is the first course in the non structural strand of the collision repair career pathway that will teach the student skills and knowledge that will help them obtain a career in the automotive body repair industry. The student will learn theory as well as hands on application in a project based setting. This training will give successful completers basic skills and knowledge to obtain an entry level job in the field of non structural damage repair.

ACCT- NSI-1. Preparation --- Students will be able to generate an overall repair plan for any repair(s) needed. Students will be able to inspect remove and store any parts that need to be replaced.

- a. Review damage report and analyze damage to determine appropriate methods for overall repair; develop and document a repair plan.
- b. Inspect, remove, store, and replace exterior trim and moldings.
- c. Inspect, remove, store, and replace interior trim and components.
- d. Inspect, remove, store, and replace non structural body panels and components that may interfere with or be damaged during repair.
- e. Inspect, remove, store, and replace all vehicle mechanical and electrical components that may interfere with or be damaged during repair.
- f. Protect panels, glass, and parts adjacent to the repair area.
- g. Soap and water wash the entire vehicle; use appropriate cleaner to remove contaminates from those areas to be repaired.
- h. Remove corrosion protection, under coatings, sealers, and other protective coatings necessary to perform repairs.
- i. Inspect, remove, and replace repairable plastics and other components that are recommended for off- vehicle repair.

Academic Standard(s)

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems

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and violations.

- SCSH3- Students will identify and investigate problems scientifically.
- Suggest reasonable hypotheses for identified problems.
 - Develop procedures for solving scientific problems.
 - Collect organize and record appropriate data.
 - Develop reasonable conclusions based on data collected.
 - Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.
- SPS8- Students will determine relationships among force, mass, and motion.
- Calculate amounts of work and mechanical advantage using simple machines.
- MM3P1- Students will solve problems (using 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.
- MM3P3- Students will communicate mathematically.
- Organize and consolidate their mathematical thinking through communication.
 - Communicate their mathematical thinking coherently and clearly to peers, teachers and others.
- MM3P4- Students will make connections among mathematical ideas and to other Disciplines.
- Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

- SC041- Applies and uses laboratory safety techniques.
- SC042- Applies and uses tables and graphs.
- SC044- Applies and uses scientific method.
- SC492- Measures force.
- SC499- Uses computers for information gathering and estimating.
- SC513- Describes and explains torque.

ACCT-NSI-2. Outer Body Panel Repairs, Replacements and Adjustments --- Students will be able to replace, align, straighten or service any exterior panel on a vehicle.

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- a. Determine the extent of direct and indirect damage and direction of impact; develop and document a repair plan.
- b. Inspect, remove and replace bolted, bonded, and welded steel panel or panel assemblies.
- c. Determine the extent of damage to aluminum body panels repair and replace.
- d. Inspect, remove, replace, and align hood, hood hinges, and hood latch.
- e. Inspect, remove, replace, and align deck lid, lid hinges, and lid latch.
- f. Inspect, remove, replace, and align doors, tailgates, hatches, lift gates, latches, hinges, and related hardware.
- g. Inspect, remove, replace, and align bumper bars, covers, reinforcement, guards, isolators, and mounting hardware.
- h. Inspect, remove, replace, and align front fenders, headers and other panels.
- i. Straighten and rough out contours of damaged panels to a suitable condition for body filling or metal finishing using power tools, hand tools, and weld-on pull attachments.
- j. Weld damaged or torn steel body panels; repair broken welds
- k. Restore corrosion protection.
- l. Replace door skins.
- m. Restore sound deadeners and foam materials.
- n. Perform panel bonding.
- o. Diagnose and repair water leaks, dust leaks, and wind noise.

Academic Standard(s)

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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

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

SPS5- Students will compare and contrast the phases of matter as

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they relate to atomic and molecular motion.

- a. Compare and contrast the atomic/molecular motion of solids, liquids, gasses and plasmas.
- b. Relate temperature, pressure, and volume of gasses to the behavior of gasses.

MM3P1- 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.

MM3P3- Students will communicate mathematically.

- d. Organize and consolidate their mathematical thinking through communication.
- c. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- n. Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses tables and graphs.

SC044- Applies and uses scientific method.

SC492- Measures force.

SC499- Uses computers for information gathering and estimating.

SC513- Describes and explains torque.

MA229- Solves problems. Generates conclusions. Demonstrates Deductive reasoning.

MA271- Determines proper operation.

MA273- Computes tolerances/ranges mentally.

MA274- Computes proper operations mentally.

ACCT-NSI-3. Metal Finishing and Body Filling --- Students will be able to straighten steel body panels by using appropriate tools. The student will be able to shrink metal, mix and apply body filler, and block sand filler to level.

- a. Remove paint from the damaged area of a body panel.

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- b. Locate and reduce surface irregularities on a damaged body panel.
- c. Demonstrate hammer and dolly techniques.
- d. Heat shrink stretched panel areas to proper contour.
- e. Cold shrink stretched panel areas to proper contour.
- f. Mix and apply body filler.
- g. Shape body filler during curing.
- h. Rough sand cured body filler to contour; finish sand.
- i. Determine the proper metal finishing techniques for aluminum.
- j. Determine the proper application of body filler to aluminum.

Academic Standard(s)

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information

SC5- Students will understand that the rate at which a chemical reaction occurs can be affected by changing concentration, temperature, or pressure and the addition of a catalyst.

- g. demonstrate the effects of changing concentration, temperature, and pressure on chemical reactions.
- h. Investigate the effects of a catalyst on chemical reactions and apply it to everyday examples.

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

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

SPS5- Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.

- a. Compare and contrast the atomic/molecular motion of solids, liquids, gasses and plasmas.
- b. Relate temperature, pressure, and volume of gasses to the behavior of gasses.

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MM3P1- Students will solve problems (using appropriate technology)

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- j. Solve problems that arise in mathematics and in other contexts.
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- e. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- l. Recognize and apply mathematics in contexts outside of mathematics.

National Academic Standards (NATEF)

SC041- Applies and uses laboratory safety techniques.
SC042- Applies and uses tables and graphs.
SC044- Applies and uses scientific method.
SC116- Describes chemical reactions with a catalyst.
SC121- Describes chemical reactions with an inhibitor.
SC213- Describes electro chemical reactions such as Oxidation/reduction.
SC395- Describes and explains solution and solvents.
SC443- Explain relative humidity.
SC492- Measures force.
SC499- Uses computers for information gathering and estimating.
SC513- Describes and explains torque.
MA229- Solves problems. Generates conclusions. Demonstrates deductive reasoning.
MA271- Determines proper operation.
MA273- Computes tolerances/ranges mentally.
MA274- Computes proper operations mentally.

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),

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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.

Students will enhance reading in all curriculum areas by:

- g. 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.
- h. 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.
- i. 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.
- j. Establishing context
 - Explore life experiences related to subject area content.

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- 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

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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.

PROGRAM CONCENTRATION: Architecture, Construction, Communications & Transportation

CAREER PATHWAY: Collision Repair

COURSE TITLE: Non Structural Damage and Body Repair II

PREREQUISITE: Non Structural Damage and Body Repair I

Course Description: Non Structural Damage and Body Repair II is the second course in the non structural strand of the collision repair career pathway that will teach the student skills and knowledge that will help them obtain a career in the automotive body repair industry. The student will learn theory as well as hands on application in a project based setting. This training will give successful completers basic skills and knowledge to obtain an entry level job in the field of non structural damage repair.

ACCT-NSII-1. Moveable Glass and Hardware --- Students will be able to remove and replace vehicle glass according to manufacturer's instructions.

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- a. Inspect, adjust, repair or replace window regulators, run channels, glass, power mechanisms, and related controls.
- b. Diagnose and repair water leaks, dust leaks, and wind noises; inspect, repair, and replace weather stripping.
- c. Inspect, repair or replace, and adjust removable, manually or power operated roof panel and hinges, latches, guides, handles, retainer, and controls of sunroofs.
- d. Inspect, remove, reinstall, and align convertible top and related mechanisms.

Academic Standard(s)

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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

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

MM3P1- Students will solve problems (using appropriate technology)

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

MM3P3- Students will communicate mathematically.

- f. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- r. Recognize and apply mathematics in contexts outside of mathematics.

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National Academic Standards (NATEF)

- SC041- Applies and uses laboratory safety techniques.
- SC042- Applies and uses tables and graphs.
- SC044- Applies and uses scientific method.
- SC499- Uses computers for information gathering and estimating.
- MA229- Solves problems. Generates conclusions. Demonstrates deductive reasoning.
- MA271- Determines proper operation.
- MA273- Computes tolerances/ranges mentally.
- MA274- Computes proper operations mentally.

ACCT-NSII-2. Metal Welding and Cutting --- Students will be proficient at welding 18 gauge mild steel using the (GMAW) mig welder. The welds learned will be a lap butt and T joints in the overhead, vertical, and flat positions. Also students will learn plug welds in all positions.

- a. Identify weldable and non weldable materials used in collision repair.
- b. Weld and cut high strength steel and other steels.
- c. Weld and cut aluminum
- d. Determine the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.
- e. Set up and adjust the MIG welder to “tune” for proper electrode stickout, voltage, polarity, flow rate, and wire speed required for the material being welded.
- f. Store, handle, move, and install high pressure gas cylinders.
- g. Determine the ground clamp location and attach.
- h. Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.
- i. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.
- j. Protect computers and other electronic control modules during welding procedures.
- k. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld through primer if necessary, and clamp is required.
- l. Determine the joint type (butt weld with backing, lap, etc.) for weld being made.
- m. Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation.

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- n. Perform the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and fillet.
- o. Perform visual and destructive tests on each weld type.
- p. Identify the causes of various welding defects; make necessary adjustments.
- q. Identify cutting process for different materials and locations; perform cutting operation.
- r. Identify different methods of attaching non-structural components (squeeze type resistant spot welds, riveting, non-structural adhesive, silicon bronze, etc.).

Academic Standard(s)

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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- a. Suggest reasonable hypotheses for identified problems.
- b. Develop procedures for solving scientific problems.
- c. Collect organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SPS5- Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.

- a. Compare and contrast the atomic/molecular motion of solids, liquids, gasses and plasmas.
- b. Relate temperature, pressure, and volume of gasses to the behavior of gasses.

MM3P1- Students will solve problems (using appropriate technology)

- s. Build new mathematical knowledge through problem solving.
- t. Solve problems that arise in mathematics and in other contexts.
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- SC042- Applies and uses tables and graphs.
- SC044- Applies and uses scientific method.
- SC177- Describes explain Describes/explains heat s electricity.
- SC180- Describes explains conductors.
- SC182- Describes/explains current AC-DC.
- SC184- Describes/explains electricity ground.
- SC187- Describes/explains electricity short circuit.
- SC197- Describes/explains electricity – generating transformers.
- SC274- Describes/explains heat conduction and convection.
- SC277- Describes/explains heat expansion and contraction.
- SC278- Describes/explains heat fusion and vaporization.
- SC282- Describes/explains heat temperature.
- SC502- Measures electrical parameters.
- SC520- Measures flow rate.
- SC521- Describes/explains flow rate.
- MA128- Distinguishes angles/circles/arcs.
- MA176- Interprets symbols.
- MA182- Measures direct temperature.
- MA229- Solves problems. Generates conclusions. Demonstrates deductive reasoning.
- MA271- Determines proper operation.
- MA273- Computes tolerances/ranges mentally.
- MA274- Computes proper operations mentally.

ACCT-NSII-3. Plastics and Adhesives --- Students will be able to identify the type of plastics used on vehicles and repair them with manufacturer approved methods.

- a. Identify the types of plastics; determine repairability.
- b. Identify the types of plastic repair procedures; clean and prepare the surface of plastic parts.
- c. Replace or repair rigid, semi rigid, and flexible plastic panels.
- d. Remove or repair damaged areas from rigid exterior composite panels.
- e. Replace bonded rigid exterior composite body panels; straighten or align panel supports.

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National Academic Standards (NATEF)

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses tables and graphs.

SC044- Applies and uses scientific method.

SC114- Describes/Explains chemical reactions.

SC116- Describes/Explains chemical reactions catalyst.

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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.

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 - 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.

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- Examine author’s purpose in writing.
- Recognize the features of disciplinary texts.
- k. 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.
- l. 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.

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PROGRAM CONCENTRATION: Architecture, Construction,
Communications & Transportation
CAREER PATHWAY: Structural Damage and Repair
COURSE TITLE: Mechanical and Electrical Components I
PREREQUISITE: Non Structural Damage and Body Repair II

Course Description: Mechanical and Electrical Components 1 is the first of two courses in the structural damage and repair career strand

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that the student will learn how mechanical and electrical components are effected in a collision and how to repair or replace them after a collision.

ACCT-MEI-1. Suspension and Steering--- Students will be able to identify and correctly replace suspension and steering parts on the most common suspension and steering systems used today.

- a. Remove and replace power rack and pinion steering gear; inspect and replace mounting bushings, tie rod ends, bellow boots, and brackets; ensure proper mounting location.
- b. Inspect remove and replace pitman arm.
- c. Inspect remove and replace steering damper
- d. Inspect remove and replace upper and lower control arms, bushings, shafts and rebound bumpers.
- e. Inspect remove and replace upper and lower ball joints.
- f. Inspect remove and replace steering knuckle and hub assemblies. (bearings seals etc.)
- g. Inspect remove and replace coil springs and insulators.
- h. Inspect remove and replace suspension system torsion bars
- i. Inspect remove and replace stabilizer bar bushings, brackets, and links.
- j. Inspect remove and replace Macpherson strut assembly.
- k. Inspect remove and replace leaf springs, shackles bushings and mounts.
- l. Inspect remove and replace shock absorbers.
- m. Inspect axle assembly for damage and misalignment.
- n. Diagnose, inspect, adjust repair or replace active suspension systems.
- o. Measure vehicle ride height.
- p. Diagnose and repair steering column damage.
- q. Diagnose steering gear noises determine repairs.
- r. Diagnose suspension system noises and body sway problems; determine repairs.
- s. Identify, check, and adjust caster, camber, and toe angles.
- t. Identify SAI, included angle, and KPI related problems and determine repair.
- u. Identify thrust angle related problems; determine needed repairs.
- v. Diagnose wheel tire vibration, shimmy, and wheel hop problems determine needed repairs.
- w. Identify torque specs and understand the importance of proper torque settings.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory, and field investigations.

- b. Demonstrate appropriate techniques in all laboratory situations.

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- c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- c. Collect, organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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

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

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

- h. Determine the conditions required to maintain a body in a state of static equilibrium.

SP3- Students will evaluate the forms and transformations of energy.

- e. Demonstrate the factors required to produce a change in momentum.

National Academic Standards (NATEF)

MA104- Calculates and evaluates precision measurement.

MA128- Distinguishes angles circles and arcs.

MA153- Formulates and verifies angles.

MA168- Identifies parallel and perpendicular lines.

MA170- Identifies vertical and horizontal lines.

MA174- Interprets charts tables and graphs.

MA180- Measures direct angles.

MA181- Measures direct distance.

MA190- Measures metric distance.

MA229- Solves problems generates conclusions.

MA245- Understands line angle relationship.

SC041- Applies and uses laboratory safety techniques.

SC044- Applies and uses scientific method.

SC052- Converts measurement units from English to metric.

SC236- Describes and explains energy/momentum.

SC253- Describes explains force/inertia.

SC503- Describes and explains hydraulic fluid systems.

SC513- Describes and explains force/torque.

SC516- Describes and explains rotational motion.

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ACCT-MEI-2. Students will be able to identify, check, repair, and test electrical components that might have been damaged during a collision.

- a. Check voltage in electrical wiring circuits with a digital multimeter.
- b. Repair electrical circuits, wiring, or connectors according to manufacturer's specifications.
- c. Inspect, test, and replace fuses, breakers, and fusible links.
- d. Perform battery state of charge test.
- e. Inspect clean and replace battery.
- f. Perform battery charge in accordance with manufacturers' recommendations.
- g. Identify programmable electric components; record data for reprogramming before disconnecting battery.
- h. Inspect, clean, and repair or replace battery cables connectors, and clamps.
- i. Check operation of exterior and interior lighting; determine needed repairs.
- j. Aim headlamps and fog lights.
- k. Remove and replace horn; check operation.
- l. Check operation of windshield washer system.
- m. Check operation of power windows, repair as needed.
- n. Check operation of electric locks, repair as needed.
- o. Demonstrate the proper self grounding procedures for handling electrical components.
- p. Check for communication errors using a scan tool.
- q. Use wiring diagrams during diagnosis of electrical circuit problems.

Academic Standard(s):

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- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

National Academic Standards (NATEF)

MA104- Calculates and evaluates precision measurement.

MA229- Solves problems generates conclusions.

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MA174- Interprets charts tables and graphs.

MA186- Measures indirect.

MA229- Solves problems generates conclusions.

MA273- Computes tolerances/ranges mentally.

MA274- Computes proper operations mentally.

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses charts, tables and graphs.

SC044- Applies and uses scientific method.

SC177- Describes explains electricity.

SC180- Describes explains conductors.

SC182- Describes explains A-C and D-C current.

SC184- Describes and explains electricity grounds.

SC186- Describes and explains electricity parallel series.

SC187- Describes and explains electricity short circuit.

SC198- Describes explains electricity / volts, amps, resistance.

SC517- Describes explains electricity- generating.

ACCT-ME1-3. Students will be able to check for damage to a vehicles brake system and If found take the appropriate steps to correct the problem.

- a. Inspect brake lines and fittings for leaks, dents, kinks, or cracks; replace If needed.
- b. Properly identify, store and install appropriate brake fluid.
- c. Bleed hydraulic brake systems according to manufacturers' procedures.
- d. Perform pressure test on hydraulic brake system; determine needed repair.
- e. Adjust, remove and install brake drums, shoes, and wheel bearings.
- f. Remove and install caliper assembly.
- g. Clean and inspect caliper mountings for wear and damage.
- h. Check parking brake system operation.
- i. Identify and replace ABS wheel speed sensor components according to manufacturer's specifications.
- j. Depressurize ABS hydraulic or electronic system according to manufacturer's procedures.
- k. Identify the proper procedures for handling brake dust.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory, and field investigations.

- b. Demonstrate appropriate techniques in all laboratory situations.
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violations.

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- e. Demonstrate the factors required to produce a change in momentum.

National Academic Standards (NATEF)

- MA104- Calculates and evaluates precision measurement.
- MA229- Solves problems generates conclusions.
- MA174- Interprets charts tables and graphs.
- MA271- Determines proper operation.
- MA273- Computes tolerances and ranges mentally.
- MA274- Computes proper operations mentally.
- SC012- Analyzes evaluates environmental issues waste management.
- SC041- Applies and uses laboratory safety techniques.
- SC042- Applies and uses charts, tables and graphs.
- SC044- Applies and uses scientific method.
- SC274- Describes explains heat conduction/convection.
- SC277- Describes explains heat expansion/contraction.
- SC282- Describes explains heat temperature.
- SC503- Describes and explains hydraulic fluid systems.

Reading Across the Curriculum

Reading Standard Comment

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- l. 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.
- m. 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.

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- n. Establishing context
- Explore life experiences related to subject area content.
 - Discuss in both writing and speaking how certain words are subject area related.
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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.

PROGRAM CONCENTRATION: Architecture, Construction, Communications & Transportation
CAREER PATHWAY: Structural Damage and Repair
COURSE TITLE: Mechanical and Electrical Components II
PREREQUISITE: Mechanical and Electrical Components I

Course Description: Mechanical and Electrical Components II is the second of two courses in the structural damage and repair career strand that the student will learn how mechanical and electrical components are effected in a collision and how to repair or replace them after a collision.

ACCT-MEII-1. Heating and Air Conditioning--- Students will be able to diagnose damage to a vehicles air conditioning system and repair or replace any components that might be damaged according to the manufacturer's procedures.

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- a. Comply with environmental regulations relating to refrigerants and coolants.
- b. Maintain and verify correct operation of certified refrigerant recovery and recharging equipment.
- c. Locate and identify A/C system service ports.
- d. Identify and recover refrigerant from A/C system.
- e. Evacuate A/C system and check for leaks.
- f. Recharge A/C system with refrigerant; perform leak test.
- g. Identify oil type and maintain correct amount in A/C system according to manufacturer's specifications.
- h. Remove and replace A/C compressor; inspect, repair or replace A/C compressor mount.
- i. Inspect, test, and replace A/C system condenser and mounts.
- j. Inspect and replace receiver/drier.
- k. Inspect and repair A/C component wiring.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory, and field investigations.

- e. Demonstrate appropriate techniques in all laboratory situations.
- f. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- e. Suggest reasonable hypotheses for identified problems.
- c. Collect, organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SPS5- Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.

- f. Relate temperature, pressure, and volume of gasses to the behavior of gasses.

National Academic Standards (NATEF)

- MA014- Calculates and evaluates precision measurement.
MA229- Solves problems generates conclusions.
MA174- Interprets charts tables and graphs.
MA182- Measures direct temperature.
MA184- Measures direct volume.
MA185- Measures direct weight.
MA186- Measures indirect.

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- MA229- Solves problems generates conclusions.
- MA273- Computes tolerances/ranges mentally.
- MA274- Computes proper operations mentally.
- MA275- Identifies temperatures Fahrenheit/centigrade.
- SC041- Applies and uses laboratory safety techniques.
- SC042- Applies and uses charts, tables and graphs.
- SC044- Applies and uses scientific method.
- SC274- Describes explains heat conduction/convection.
- SC277- Describes explains heat expansion/contraction.
- SC282- Describes explains heat temperature.
- SC341- Describes explains matter phases/states.

ACCT-ME11-2. Cooling Systems--- Students will diagnose a vehicles cooling system and repair or replace any components that might be damaged according to the manufacturer's procedures.

- a. Inspect and replace engine cooling and heater system hoses and belts.
- b. Inspect, test, remove and replace radiator, pressure cap, coolant recovery system, and water pump.
- c. Recover, refill, and bleed system with proper coolant and check level of protection; leak test system and dispose of materials in accordance with EPA regulations.
- d. Remove and replace fan (both mechanical and electric), fan pulley, fan clutch, and fan shroud.
- e. Inspect, remove, and replace auxiliary oil/fluid coolers; check oil levels.
- f. Inspect, remove, and replace electric fan sensors; check operation.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory, and field investigations.

- g. Demonstrate appropriate techniques in all laboratory situations.
- h. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- c. Collect, organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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National Academic Standards (NATEF)

- MA014- Calculates and evaluates precision measurement.
- MA229- Solves problems generates conclusions.
- MA174- Interprets charts tables and graphs.
- MA182- Measures direct temperature.
- MA184- Measures direct volume.
- MA229- Solves problems generates conclusions.
- MA273- Computes tolerances/ranges mentally.
- MA274- Computes proper operations mentally.
- MA275- Identifies temperatures Fahrenheit/centigrade.
- SC041- Applies and uses laboratory safety techniques.
- SC042- Applies and uses charts, tables and graphs.
- SC044- Applies and uses scientific method.
- SC212- Describes and explains electrochemical reactions.
- SC255- Describes and explains force/pressure.
- SC274- Describes explains heat conduction/convection.
- SC277- Describes explains heat expansion/contraction.
- SC282- Describes explains heat temperature.
- SC338- Describes explains matter density/specific gravity.
- SC395- Describes and explains solutions.
- SC497- Measures volume of liquids.
- SC521- Describes explains flow rate.
- SC531- Describes and explains viscosity.

ACCT-MEII-3. Drive Train--- Students will diagnose a vehicles drive train and be able to replace damaged components according to manufacturer's procedures.

- a. Remove, replace, and adjust shift or clutch linkage as required.
- b. Remove, replace and adjust cables or linkages for throttle valve kickdown, and accelerator pedal.
- c. Remove and replace electronic sensors, wires, and connectors.
- d. Remove and replace powertrain assembly; inspect, replace, and align powertrain mounts.
- e. Remove and replace drive axle assembly.
- f. Inspect, remove and replace half shafts and axle constant velocity (CV) joints.
- g. Inspect, remove, and replace drive shafts and universal joints.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory, and field investigations.

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- b. Demonstrate appropriate techniques in all laboratory situations.
- c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- c. Collect, organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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

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

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

- i. Determine the conditions required to maintain a body in a state of static equilibrium.

SP3- Students will evaluate the forms and transformations of energy.

- e. Demonstrate the factors required to produce a change in momentum.

National Academic Standards (NATEF)

MA014- Calculates and evaluates precision measurement.

MA229- Solves problems generates conclusions.

MA174- Interprets charts tables and graphs.

MA229- Solves problems generates conclusions.

MA273- Computes tolerances/ranges mentally.

MA274- Computes proper operations mentally.

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses charts, tables and graphs.

SC044- Applies and uses scientific method.

SC249- Describes explains energy force. (balanced / unbalanced)

SC507- Describes explains motion lubrication.

ACCT-ME11-4. Fuel, Intake and Exhaust Systems--- Students will diagnose a vehicles fuel, intake and exhaust systems and be able to replace damaged components according to manufacturer's procedures.

- a. Inspect, remove and replace exhaust pipes, mufflers, converters, resonators, tail pipes, and heat shields.
- b. Inspect, remove and replace fuel tank, fuel tank filter, fuel cap, fuel filler hose,

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and inertia switch; inspect and replace fuel lines and hoses; check fuel for contaminants.

- c. Inspect, remove and replace engine components of air intake systems.
- d. Inspect, remove and replace canister, filter, vent, and purge lines of fuel vapor control systems.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory, and field investigations.

- e. Demonstrate appropriate techniques in all laboratory situations.
- f. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- c. Collect, organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

National Academic Standards (NATEF)

MA014- Calculates and evaluates precision measurement.

MA229- Solves problems generates conclusions.

MA174- Interprets charts tables and graphs.

MA229- Solves problems generates conclusions.

MA273- Computes tolerances/ranges mentally.

MA274- Computes proper operations mentally.

SC007- Analyzes and evaluates environmental issues.

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses charts, tables and graphs.

SC044- Applies and uses scientific method.

SC406- Describes explains sound.

SC494- Measures pressure.

ACCT-MEII-5. Restraint Systems--- Students will understand how restraint systems work and how to inspect for damage after a collision. Students will be able to service or replace restraint systems according to manufacturer's procedures.

1. Active Restraint Systems

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- a. Inspect, remove and replace seatbelt and shoulder harness assembly and components in accordance with manufacturer's specifications and procedures.
- b. Inspect restraint system mounting areas for damage; repair in accordance with manufacturer's specifications/procedures.
- c. Verify proper operation of seatbelt In accordance with manufacturer's specifications and procedures.

2. Passive Restraint Systems

- a. Inspect, remove and replace seatbelt and shoulder harness assembly and components in accordance with manufacturer's specifications and procedures.
- b. Inspect restraint system mounting areas for damage; repair in accordance with manufacturer's specifications/procedures.
- c. Verify proper operation of seatbelt In accordance with manufacturer's specifications and procedures.
- d. Inspect, remove and replace track and drive assembly, lap retractor, torso retractor, inboard buckle lap retractor, tensioners and knee bolster in accordance with manufacturer's specifications and procedures.

3. Supplemental Restraint System (SRS)

- a. Disarm SRS in accordance with manufacturer's procedures.
- b. Inspect, remove and replace sensors and wiring in accordance with manufacturer's specifications and procedures; ensure sensor orientation.
- c. Inspect, remove, and replace, and dispose of deployed SRS modules in accordance with manufacturer's specifications and procedures.
- d. Verify that SRS is operational in accordance with manufacturer's specifications and procedures.
- e. Inspect, remove, and replace, and dispose of non-deployed SRS modules in accordance with manufacturer's specifications and procedures.
- f. Diagnose and repair SRS using fault codes and test equipment.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory, and field investigations.

- b. Demonstrate appropriate techniques in all laboratory situations.
- c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- a. Suggest reasonable hypotheses for identified problems.
- c. Collect, organize and record appropriate data.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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- SPS8- Students will determine relationships among force, mass, and motion.
- Calculate velocity and acceleration.
 - Apply Newton's three laws to everyday situations by explaining the following:
 - Inertia
 - Relationship between force, mass, and acceleration
 - Equal and opposite forces

National Academic Standards (NATEF)

- MA014- Calculates and evaluates precision measurement.
- MA229- Solves problems generates conclusions.
- MA174- Interprets charts tables and graphs.
- MA229- Solves problems generates conclusions.
- MA273- Computes tolerances/ranges mentally.
- MA274- Computes proper operations mentally.
- SC007- Analyzes and evaluates environmental issues.
- SC041- Applies and uses laboratory safety techniques.
- SC042- Applies and uses charts, tables and graphs.
- SC044- Applies and uses scientific method.
- SC177- Describes explains electricity.
- SC180- Describes explains conductors.
- SC182- Describes explains A-C and D-C current.
- SC184- Describes and explains electricity grounds.
- SC186- Describes and explains electricity parallel series.
- SC187- Describes and explains electricity short circuit.
- SC198- Describes explains electricity / volts, amps, resistance.
- SC253- Describes explains force inertia.

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.

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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.

Students will enhance reading in all curriculum areas by:

- m. 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.
- n. 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.
- o. 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.
- p. 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.

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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

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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.

PROGRAM CONCENTRATION: Architecture, Construction,
Communications & Transportation

CAREER PATHWAY: Collision
Repair

COURSE TITLE: Structural Analysis and Damage
Repair I

PREREQUISITE: Non Structural Damage and Body Repair
II

Course Description: Structural Analysis and Damage Repair 1 is the starting point in the Structural Repair career pathway. This course will prepare the student for an entry level position in a specialized area of Collision Repair. The student will learn, through theoretical and practical applications, to analyze and restore vehicle structural damage to factory specifications.

ACCT-SDRI-1 Frame Inspection and Repair: Students will be able to analyze structural Frame damage relative to factory specifications, determine and undertake the proper procedures to restore damaged areas to the correct specifications. Students will recognize the difference between Frame

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and Unibody vehicles and understand that each type require different repair procedures.

- a. Diagnose and measure structural damage using tram and self-centering gauges.
- b. Attach vehicle to anchoring devices
- c. Analyze, straighten and align mash (collapse) damage.
- d. Analyze, straighten and align sag damage.
- e. Analyze, straighten and align sideway damage.
- f. Analyze, straighten and align twist damage.
- g. Analyze, straighten and align diamond frame damage.
- h. Remove and replace damaged structural components.
- i. Restore corrosion protection to repaired or replaced frame areas.
- j. Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.
- k. Align or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and wheel alignment problems.
- l. Identify heat limitations in structural components.
- m. Restore structural foam.
- n. Diagnose and measure structural damage using a universal measuring system (mechanical, electrical, laser).
- o. Diagnose and measure structural damage to vehicles using a dedicated (fixture) measuring system.
- p. Determine the extent of the direct and indirect damage and the direction of impact; document the methods and sequence of repair.
- q. Analyze and identify crush/collapse zones.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

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.
- e. Develop reasonable conclusions based on data collected.
- f. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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

- a. Calculate velocity and acceleration.
- b. Apply Newton's three laws to everyday situations by explaining the following:
 - Inertia
 - Relationship between force, mass and acceleration
 - Equal and opposite forces
- d. Explain the difference in mass and weight.
- e. Calculate amounts of work and mechanical advantage using simple machines.

SP3. Students will evaluate the forms and transformations of energy.

- c. Measure and calculate the vector nature of momentum.
- d. Compare and contrast elastic and inelastic collisions.

M6G1. Students will further develop their understanding of plane figures.

- a. Determine and use lines of symmetry.
- b. Investigate rotational symmetry, including degree of rotation.
- c. Use the concepts of ratio, proportion and scale factor to demonstrate the relationships between similar plane figures.
- d. Interpret and sketch simple scale drawings.
- e. Solve problems involving scale drawings.

MM3P1- Students will solve problems (using appropriate technology)

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

MM3P3- Students will communicate mathematically.

- h. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- aa. Recognize and apply mathematics in contexts outside of mathematics.

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ELA10RL1 The student demonstrates comprehension by identifying evidence (i.e., examples of diction, imagery, point of view, figurative language, symbolism, plot events and main ideas) in a variety of texts representative of different genres (i.e., poetry, prose [short story, novel, essay, editorial, biography], and drama) and using this evidence as the basis for interpretation.

The student identifies, analyzes, and applies knowledge of the purpose, structure, and elements of nonfiction and/or informational materials and provides evidence from the text to support understanding; the student:

- a. Analyzes and explains the structures and elements of nonfiction works such as newspaper articles and editorials, magazine articles, journal articles, and/or other informational texts.

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

National Academic Standards (NATEF)

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses tables and graphs.

SC044- Applies and uses scientific method.

SC052 Converts Measurement Units English/Metric

- The technician can convert measurements taken in the English or metric system to specifications stated in terms of either system.

SC236 Describes/Explains Energy Momentum

- The technician can explain how energy is dissipated through the body based on the momentum of the vehicle at the time of the impact.

SC248 Describes/Explains Force

- The technician can explain the principles of force as it applies to the realignment of a component.

SC249 Describes/Explains Energy Force, Balanced/Unbalanced

- The technician can demonstrate an understanding of the role of balanced and unbalanced forces on linear or rotating vehicle assemblies.

SC253 Describes/Explains Force Inertia

- The technician can explain how the rate of a force in motion can impact on an automobile body in a variety of ways.

SC255 Describes/Explains Force Pressure

- The technician can demonstrate an understanding of the concept of pressure in relation to the concept of force.

SC280 Describes/Explains Heat Insulation

- The technician can explain the role of insulation in maintaining stable temperatures or in preventing the transfer of heat to an unwanted area.

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SC395 Describes/Explains Solutions Solvent

- The technician understands the use and safety requirements of all solvents used in an autobody environment.

SC447 Describes/Explains Work Levers

- The technician can explain how levers can be used to increase an applied force over distance.

SC448 Describes/Explains Work Pulleys

- The technician can explain how pulleys can be used to increase an applied force over distance.

SC492- Measures force.

SC499- Uses computers for information gathering and estimating.

SC513- Describes and explains torque

SC528 Describes/Explains Adhesives/Sealants

- The technician can demonstrate an understanding of how surface processes and cohesive/adhesive forces aid in glues, tapes, and sealants.

MA014 Calculates/Evaluates Measurement Precision

- The technician uses a variety of techniques to determine if selected measurements are precise and in congruence with manufacturer's specifications.

MA026 Computes Addition Decimals

- The technician can add numbers that include decimals to determine conformance with the manufacturer's specifications.

MA028 Computes Addition Mentally

- The technician can mentally add two or more numbers to determine conformance with the manufacturer's specifications.

MA034 Computes Addition Whole Numbers

- The technician can add whole numbers to accurately determine measurement conformance with the manufacturer's specifications.

MA039 Computes Division Decimals

- The technician can divide decimals to determine measurement conformance with the manufacturer's specifications.

MA047 Computes Division Whole Numbers

- The technician can divide whole numbers to determine differences for comparison with the manufacturer's specifications.

MA065 Computes Multiplication Decimals

- The technician can multiply numbers that include decimals to determine conformance with the manufacturer's specifications.

MA067 Computes Multiplication Mentally

- The technician can mentally multiply numbers that include decimals to determine conformance with the manufacturer's specifications.

MA073 Computes Subtraction Whole Numbers

- The technician can subtract whole numbers to determine differences for comparison with the manufacturer's specifications.

MA084 Computes Subtraction Decimals

- The technician can subtract numbers that include decimals to determine conformance with the manufacturer's specifications.

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MA086 Computes Subtraction Mentally

MA092 Computes Subtraction Whole Numbers

- The technician can subtract whole numbers to determine differences for comparison with the manufacturer's specifications.

MA126 Converts Units English/Metric -- Feet/Meters, e.g.

- The technician can measure/test with tools designed for English or metric measurements and then convert the resulting measurement to the system used by the manufacturers for specifying the correct measurement or tolerance.

MA128 Distinguishes Angles/Circles/Arcs

- The technician must be highly skilled in determining if certain angles, circles, or arcs have the proper shape and relationship after an impact has distorted or misaligned them.

MA129 Distinguishes Congruence/Similarity Geometric Figures

- The technician can distinguish whether or not the angle between related parts (e.g. body or suspension components) is within the manufacturer's specifications.

MA131 Distinguishes Equal/Not Equal

- The technician can distinguish when a measurement or tolerance is not equal to the manufacturer's specification.

MA132 Distinguishes Estimate/Exact Value

- The technician can distinguish the need to use an exact value versus an estimated value, depending upon the structural damage and integrity of the system.

MA140 Estimates/Rounds Expected Outcomes Everyday Occurrences

- The technician estimates the anticipated performance outcome of a normally operating system as well as the expected outcome of everyday occurrences such as the result of a body parameter being out of conformance with the manufacturer's specifications.

MA146 Estimates/Rounds Numbers Add/Subtract/Divide/Multiply

- The technician can estimate the results of basic arithmetic operations, and can accurately round up or down depending on the appropriate rule for the situation.

MA153 Formulates/Verifies Angles

- The technician can visually formulate an angle (e.g. suspension system, chassis, or body component alignment) and verify its conformance to the manufacturer's specified angle as well as the angle of the spray pattern or spray equipment.

MA161 Identifies English Measures Length/Volume/Weight

- The technician can determine the degree of conformance to the manufacturer's specifications for length, volume and any other appropriate measurements in the English system.

MA168 Identifies Lines Parallel/Perpendicular

- The technician can use measurement devices to determine the parallelism or perpendicularity of chassis, suspension, and other vehicle dimension requiring geometric alignment principles.

MA170 Identifies Lines Vertical/Horizontal

- The technician must be very skilled in determining if the lines of an automobile are vertical or horizontal as specified in the original design specifications.

MA171 Identifies Metric Measures Length/Volume/Weight

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- The technician can determine the degree of conformance to the manufacturer's specifications for length, volume and other appropriate measurements using the metric system.

MA174 Interprets Charts/Tables/Graphs

- The technician can interpret charts, tables, or graphs to determine the manufacturer's specifications for a given system.

MA176 Interprets Symbols $<$, $>$, $=$, e.g.

- The technician interprets symbols to determine compliance with the manufacturer's specifications.

MA177 Interprets System of Numbers Place Value

- The technician is able to interpret place value (tenths, hundredths, and thousandths) when conducting precision measurements.

MA180 Measures Direct Angles

- The technician can use angle measurement equipment and techniques to determine any vehicle angle measurement variance from the manufacturer's specifications.

MA181 Measures Direct Distance

- The technician can measure distance using a variety of devices to determine conformance to the manufacturer's tolerances and specifications.

MA182 Measures Direct Temperature

- The technician can use appropriate temperature measurement tools to determine the existing temperature of ambient air and that of paints and inhibitors.

MA186 Measures Indirect

- The technician can use various forms of indirect measurement to determine if components are in conformance with manufacturer's specifications.

MA190 Measures Metric Distance

- The technician can use metric measurement instruments to determine correct sizes or distances in the metric system.

MA229- Solves problems. Generates conclusions. Demonstrates deductive reasoning.

MA244 Understands Geometric Figures Visual Perception

- The technician can visually perceive the geometric relationships of systems and sub-systems requiring alignment or verification.

MA245 Understands Line/Angle Relationships

- The technician understands the necessity of verifying that the relationship of parallel lines and angles concur with the manufacturer's specifications when diagnosing the alignment of a body component, chassis, or steering and suspension system.

MA275 Identifies Temperatures Fahrenheit/Centigrade

The technician can identify whether a temperature measurement should be made using a Fahrenheit or Centigrade measuring device.

MA271- Determines proper operation.

MA273- Computes tolerances/ranges mentally.

MA274- Computes proper operations mentally

LA038 Collects/Organizes Information-Oral/Written

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- The technician collects and organizes oral and written information based on discussions, notes, observations, personal experiences, and data collection that will assist in the problem analysis and solution process.

LA069 Composes/Edits Notes

- The technician makes notes regarding symptoms, possible causes of problems, and other data that will aid in the diagnosis and problem solving process.

LA278 Uses Text Resources

- The technician uses text resources such as glossaries of terms, service manual indexes, database menus, and tables of contents to gather data for diagnosis and repair.

LA283 Uses Media Resources Databases

- The technician uses computerized and other databases to obtain system information.

LA285 Comprehends Information-Written Operator's Manual

- The technician can comprehend

ACCT-SDR1-2 Unibody Inspection, Measurement, and Repair:
Students will be able to analyze structural Unibody damage relative to factory specifications, determine and undertake the proper procedures to restore damaged areas to the correct specifications. Students will recognize the difference between Frame and Unibody vehicles and understand that each type require different repair procedures.

- a. Analyze and identify misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering, and chassis alignment problems.
- b. Realign or replace misaligned or damaged steering, suspension, and powertrain components that can cause vibration, steering and chassis alignment problems.
- c. Diagnose and measure unibody damage using tram and self-centering gauges.
- d. Determine and inspect the locations of all suspension, steering, and powertrain component attaching points on the vehicle.
- e. Diagnose and measure unibody vehicles using a dedicated (fixture) measuring system.
- f. Diagnose and measure unibody vehicles using a universal measuring system (Mechanical, electronic, and laser).
- g. Determine the extent of the direct and indirect damage and the direction of impact; plan and document the methods and sequence of repair.
- h. Attach anchoring devices to vehicle; remove or reposition components as necessary.
- i. Straighten and align cowl assembly.
- j. Identify heat limitations in unibody vehicles.
- k. Identify proper cold stress relief methods.

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- l. Repair damage using power tools and hand tools to restore proper contours and dimensions.
- m. Remove and replace damaged sections of structural steel body panels.
- n. Restore corrosion protection to repaired or replaced unibody structural areas.
- o. Determine the extent of damage to aluminum structural components; repair, weld, or replace.
- p. Analyze and identify crush/collapse zones

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- b. Suggest reasonable hypotheses for identified problems.
- c. Develop procedures for solving scientific problems.
- d. Collect organize and record appropriate data.
- f. Develop reasonable conclusions based on data collected.
- g. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

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

- a. Calculate velocity and acceleration.
- b. Apply Newton's three laws to everyday situations by explaining the following:
 - Inertia
 - Relationship between force, mass and acceleration
 - Equal and opposite forces
- c. Relate falling objects to gravitational force
- d. Explain the difference in mass and weight.
- e. Calculate amounts of work and mechanical advantage using simple machines.

MM3P1- Students will solve problems (using appropriate technology)

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

MM3P3- Students will communicate mathematically.

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- i. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- ee. Recognize and apply mathematics in contexts outside of mathematics.

ELA10RL1 The student demonstrates comprehension by identifying evidence (i.e., examples of diction, imagery, point of view, figurative language, symbolism, plot events and main ideas) in a variety of texts representative of different genres (i.e., poetry, prose [short story, novel, essay, editorial, biography], and drama) and using this evidence as the basis for interpretation.

The student identifies, analyzes, and applies knowledge of the purpose, structure, and elements of nonfiction and/or informational materials and provides evidence from the text to support understanding; the student:

- a. Analyzes and explains the structures and elements of nonfiction works such as newspaper articles and editorials, magazine articles, journal articles, and/or other informational texts.

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

National Academic Standards (NATEF)

SC041- Applies and uses laboratory safety techniques.

SC042- Applies and uses tables and graphs.

SC044- Applies and uses scientific method.

SC052 Converts Measurement Units English/Metric

- The technician can convert measurements taken in the English or metric system to specifications stated in terms of either system.

SC236 Describes/Explains Energy Momentum

- The technician can explain how energy is dissipated through the body based on the momentum of the vehicle at the time of the impact.

SC248 Describes/Explains Force

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- The technician can explain the principles of force as it applies to the realignment of a component.

SC249 Describes/Explains Energy Force, Balanced/Unbalanced

- The technician can demonstrate an understanding of the role of balanced and unbalanced forces on linear or rotating vehicle assemblies.

SC253 Describes/Explains Force Inertia

- The technician can explain how the rate of a force in motion can impact on an automobile body in a variety of ways.

SC255 Describes/Explains Force Pressure

- The technician can demonstrate an understanding of the concept of pressure in relation to the concept of force.

SC280 Describes/Explains Heat Insulation

- The technician can explain the role of insulation in maintaining stable temperatures or in preventing the transfer of heat to an unwanted area.

SC395 Describes/Explains Solutions Solvent

- The technician understands the use and safety requirements of all solvents used in an autobody environment.

SC447 Describes/Explains Work Levers

- The technician can explain how levers can be used to increase an applied force over distance.

SC448 Describes/Explains Work Pulleys

- The technician can explain how pulleys can be used to increase an applied force over distance.

SC492- Measures force.

SC499- Uses computers for information gathering and estimating.

SC513- Describes and explains torque

SC528 Describes/Explains Adhesives/Sealants

- The technician can demonstrate an understanding of how surface processes and cohesive/adhesive forces aid in glues, tapes, and sealants.

MA014 Calculates/Evaluates Measurement Precision

- The technician uses a variety of techniques to determine if selected measurements are precise and in congruence with manufacturer's specifications.

MA026 Computes Addition Decimals

- The technician can add numbers that include decimals to determine conformance with the manufacturer's specifications.

MA028 Computes Addition Mentally

- The technician can mentally add two or more numbers to determine conformance with the manufacturer's specifications.

MA034 Computes Addition Whole Numbers

- The technician can add whole numbers to accurately determine measurement conformance with the manufacturer's specifications.

MA039 Computes Division Decimals

- The technician can divide decimals to determine measurement conformance with the manufacturer's specifications.

MA047 Computes Division Whole Numbers

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- The technician can divide whole numbers to determine differences for comparison with the manufacturer's specifications.

MA065 Computes Multiplication Decimals

- The technician can multiply numbers that include decimals to determine conformance with the manufacturer's specifications.

MA067 Computes Multiplication Mentally

- The technician can mentally multiply numbers that include decimals to determine conformance with the manufacturer's specifications.

MA073 Computes Subtraction Whole Numbers

- The technician can subtract whole numbers to determine differences for comparison with the manufacturer's specifications.

MA084 Computes Subtraction Decimals

- The technician can subtract numbers that include decimals to determine conformance with the manufacturer's specifications.

MA086 Computes Subtraction Mentally

The technician can mentally subtract numbers to arrive at a difference for comparison with the manufacturer's specifications.

MA092 Computes Subtraction Whole Numbers

- The technician can subtract whole numbers to determine differences for comparison with the manufacturer's specifications.

MA126 Converts Units English/Metric -- Feet/Meters, e.g.

- The technician can measure/test with tools designed for English or metric measurements and then convert the resulting measurement to the system used by the manufacturers for specifying the correct measurement or tolerance.

MA128 Distinguishes Angles/Circles/Arcs

- The technician must be highly skilled in determining if certain angles, circles, or arcs have the proper shape and relationship after an impact has distorted or misaligned them.

MA129 Distinguishes Congruence/Similarity Geometric Figures

- The technician can distinguish whether or not the angle between related parts (e.g. body or suspension components) is within the manufacturer's specifications.

MA131 Distinguishes Equal/Not Equal

- The technician can distinguish when a measurement or tolerance is not equal to the manufacturer's specification.

MA132 Distinguishes Estimate/Exact Value

- The technician can distinguish the need to use an exact value versus an estimated value, depending upon the structural damage and integrity of the system.

MA140 Estimates/Rounds Expected Outcomes Everyday Occurrences

- The technician estimates the anticipated performance outcome of a normally operating system as well as the expected outcome of everyday occurrences such as the result of a body parameter being out of conformance with the manufacturer's specifications.

MA146 Estimates/Rounds Numbers Add/Subtract/Divide/Multiply

- The technician can estimate the results of basic arithmetic operations, and can accurately round up or down depending on the appropriate rule for the situation.

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MA153 Formulates/Verifies Angles

- The technician can visually formulate an angle (e.g. suspension system, chassis, or body component alignment) and verify its conformance to the manufacturer's specified angle as well as the angle of the spray pattern or spray equipment.

MA161 Identifies English Measures Length/Volume/Weight

- The technician can determine the degree of conformance to the manufacturer's specifications for length, volume and any other appropriate measurements in the English system.

MA168 Identifies Lines Parallel/Perpendicular

- The technician can use measurement devices to determine the parallelism or perpendicularity of chassis, suspension, and other vehicle dimension requiring geometric alignment principles.

MA170 Identifies Lines Vertical/Horizontal

- The technician must be very skilled in determining if the lines of an automobile are vertical or horizontal as specified in the original design specifications.

MA171 Identifies Metric Measures Length/Volume/Weight

- The technician can determine the degree of conformance to the manufacturer's specifications for length, volume and other appropriate measurements using the metric system.

MA174 Interprets Charts/Tables/Graphs

- The technician can interpret charts, tables, or graphs to determine the manufacturer's specifications for a given system.

MA176 Interprets Symbols $<$, $>$, $=$, e.g.

- The technician interprets symbols to determine compliance with the manufacturer's specifications.

MA177 Interprets System of Numbers Place Value

- The technician is able to interpret place value (tenths, hundredths, and thousandths) when conducting precision measurements.

MA180 Measures Direct Angles

- The technician can use angle measurement equipment and techniques to determine any vehicle angle measurement variance from the manufacturer's specifications.

MA181 Measures Direct Distance

- The technician can measure distance using a variety of devices to determine conformance to the manufacturer's tolerances and specifications.

MA182 Measures Direct Temperature

- The technician can use appropriate temperature measurement tools to determine the existing temperature of ambient air and that of paints and inhibitors.

MA186 Measures Indirect

- The technician can use various forms of indirect measurement to determine if components are in conformance with manufacturer's specifications.

MA190 Measures Metric Distance

- The technician can use metric measurement instruments to determine correct sizes or distances in the metric system.

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MA229- Solves problems. Generates conclusions. Demonstrates deductive reasoning.

MA244 Understands Geometric Figures Visual Perception

- The technician can visually perceive the geometric relationships of systems and sub-systems requiring alignment or verification.

MA245 Understands Line/Angle Relationships

- The technician understands the necessity of verifying that the relationship of parallel lines and angles concur with the manufacturer's specifications when diagnosing the alignment of a body component, chassis, or steering and suspension system.

MA275 Identifies Temperatures Fahrenheit/Centigrade

The technician can identify whether a temperature measurement should be made using a Fahrenheit or Centigrade measuring device.

MA271- Determines proper operation.

MA273- Computes tolerances/ranges mentally.

MA274- Computes proper operations mentally

LA038 Collects/Organizes Information-Oral/Written

- The technician collects and organizes oral and written information based on discussions, notes, observations, personal experiences, and data collection that will assist in the problem analysis and solution process.

LA069 Composes/Edits Notes

- The technician makes notes regarding symptoms, possible causes of problems, and other data that will aid in the diagnosis and problem solving process.

LA278 Uses Text Resources

- The technician uses text resources such as glossaries of terms, service manual indexes, database menus, and tables of contents to gather data for diagnosis and repair.

LA283 Uses Media Resources Databases

- The technician uses computerized and other databases to obtain system information.

LA285 Comprehends Information-Written Operator's Manual

- The technician can comprehend

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),

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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.

Students will enhance reading in all curriculum areas by:

- o. 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.
- p. 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.
- q. 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.
- r. Establishing context
 - Explore life experiences related to subject area content.

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- 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

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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.

PROGRAM CONCENTRATION: Architecture, Construction, Communications & Transportation

CAREER PATHWAY: Collision Repair

COURSE TITLE: Structural Analysis and Damage Repair II

PREREQUISITE: Structural Analysis and Damage Repair I

Course Description: Structural Analysis and Damage Repair II is the second and final course in the Structural Repair career pathway. This course will continue in the preparation the student for an entry level position in a specialized area of Collision Repair. The student will continue to learn, through theoretical and practical applications, to analyze and restore vehicle structural damage to factory specifications.

ACCT-SDRII-1 Fixed Glass: Students will be able to install and remove windshields rear glass and fixed quarter glasses using the appropriate tools, techniques and materials. Students will understand the relationship between fixed glass and vehicle structural integrity.

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- a. Remove and reinstall or replace fixed glass (heated and non-heated) using recommended materials.
- b. Remove and reinstall or replace modular glass using recommended materials.

Academic Standard(s):

SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- e. Suggest reasonable hypotheses for identified problems.
- f. Develop procedures for solving scientific problems.
- g. Collect organize and record appropriate data.
- h. Develop reasonable conclusions based on data collected.
- i. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SC5. Students will understand that the rate at which a chemical reaction occurs can be affected by changing concentration, temperature, or pressure and the addition of a catalyst.

- a. Demonstrate the effects of changing concentration, temperature, and pressure on chemical reactions.

M6G1. Students will further develop their understanding of plane figures.

- a. Determine and use lines of symmetry.
- b. Investigate rotational symmetry, including degree of rotation.
- c. Use the concepts of ratio, proportion and scale factor to demonstrate the relationships between similar plane figures.
- d. Interpret and sketch simple scale drawings.
- e. Solve problems involving scale drawings.

ELA10RL1 The student demonstrates comprehension by identifying evidence (i.e., examples of diction, imagery, point of view, figurative language, symbolism, plot events and main ideas) in a variety of texts representative of different genres (i.e., poetry, prose [short story, novel, essay, editorial, biography], and drama) and using this evidence as the basis for interpretation.

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The student identifies, analyzes, and applies knowledge of the purpose, structure, and elements of nonfiction and/or informational materials and provides evidence from the text to support understanding; the student:

- a. Analyzes and explains the structures and elements of nonfiction works such as newspaper articles and editorials, magazine articles, journal articles, and/or other informational texts.

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

National Academic Standards (NATEF)

SC041- Applies and uses laboratory safety techniques.

SC044- Applies and uses scientific method.

SC114 Describes/Explains Chemical Reactions

- The technician can demonstrate an understanding of the chemical reaction that occurs in various substances used in the automobile.

SC116 Describes/Explains Chemical Reactions Catalysts

- The technician can explain the role a catalyst plays in the mixing of fillers or finishes for use on the automobile body.

SC121 Describes/Explains Chemical Reactions Inhibitors

- The technician can explain the purpose of adding additives to an autobody repair compound.

SC395 Describes/Explains Solutions Solvent

- The technician understands the use and safety requirements of all solvents used in an autobody environment.

SC492- Measures force.

SC499- Uses computers for information gathering and estimating.

SC528 Describes/Explains Adhesives/Sealants

- The technician can demonstrate an understanding of how surface processes and cohesive/adhesive forces aid in glues, tapes, and sealants.

SC530 Describes/Explains Chemical Reactions Activators

- The technician can describe or explain the role that activators have in causing a change in the chemical state of a compound or filler.

MA229- Solves problems. Generates conclusions. Demonstrates Deductive reasoning.

MA271- Determines proper operation.

MA273- Computes tolerances/ranges mentally.

MA274- Computes proper operations mentally.

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ACCT-SDR11-2 Metal Welding and Cutting: Students will be competent in MIG welding techniques pertinent to Auto Collision Repair with emphasis on structural welding and heat control. Students will learn the relationship between heat and the structural integrity of metals. Students will also learn Oxy-Acetylene welding and cutting along with plasma cutting

- a. Identify weldable and non-weldable materials used in collision repair.
- b. Weld and cut high-strength steel and other steels.
- c. Weld and cut aluminum.
- d. Determine the correct GMAW (MIG) welder type, electrode, wire type, diameter, and gas to be used in a specific welding situation.
- e. Set up and adjust the GMAW (MIG) welder to "tune" for proper electrode stickout, voltage, polarity, flow rate, and wire-feed speed required for the material being welded.
- f. Store, handle, and install high-pressure gas cylinders.
- g. Determine work clamp (ground) location and attach.
- h. Use the proper angle of the gun to the joint and direction of gun travel for the type of weld being made in the flat, horizontal, vertical, and overhead positions.
- i. Protect adjacent panels, glass, vehicle interior, etc. from welding and cutting operations.
- j. Protect computers and other electronic control modules during welding procedures.
- k. Clean and prepare the metal to be welded, assure good metal fit-up, apply weld-through primer if necessary, and clamp as required.
- l. Determine the joint type (butt weld with backing, lap, etc.) for weld being made.
- m. Determine the type of weld (continuous, butt weld with backing, plug, etc.) for each specific welding operation.
- n. Perform the following welds: continuous, stitch, tack, plug, butt weld with and without backing, and fillet weld.
- o. Perform visual and destructive tests on each weld type.
- p. Identify the causes of various welding defects; make necessary adjustments.
- q. Identify cause of contact tip burn-back and failure of wire to feed; make necessary adjustments
- r. Identify cutting process for different materials and locations; perform cutting operation.
- s. Identify different methods of attaching structural components (squeeze type resistance spot welding (STRSW), riveting, structural adhesive, silicon bronze, etc.)

Academic Standard(s):

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SCSH2- Students will use standard safety practices for all classroom, laboratory and field investigations.

- c. Follow correct protocol for identifying and reporting safety problems and violations.

SCSH3- Students will identify and investigate problems scientifically.

- d. Suggest reasonable hypotheses for identified problems.
- e. Develop procedures for solving scientific problems.
- f. Collect organize and record appropriate data.
- g. Develop reasonable conclusions based on data collected.
- h. Evaluate whether conclusions are reasonable by reviewing the process and checking against other available information.

SPS5. Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.

- a. Compare and contrast the atomic/molecular motion of solids, liquids, gases and plasmas.
- b. Relate temperature, pressure, and volume of gases to the behavior of gases.

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

- a. Identify energy transformations within a system (e.g. lighting of a match).
- b. Investigate molecular motion as it relates to thermal energy changes in terms of conduction, convection, and radiation.

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

- b. Explain the flow of electrons in terms of alternating and direct current, the relationship among voltage, resistance and current.

M6G1. Students will further develop their understanding of plane figures.

- a. Determine and use lines of symmetry.
- b. Investigate rotational symmetry, including degree of rotation.
- c. Use the concepts of ratio, proportion and scale factor to demonstrate the relationships between similar plane figures.
- d. Interpret and sketch simple scale drawings.
- e. Solve problems involving scale drawings.

MM3P1- Students will solve problems (using appropriate technology)

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

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MM3P3- Students will communicate mathematically.

- j. Organize and consolidate their mathematical thinking through communication.
- b. Communicate their mathematical thinking coherently and clearly to peers, teachers and others.

MM3P4- Students will make connections among mathematical ideas and to other disciplines.

- ii. Recognize and apply mathematics in contexts outside of mathematics.

ELA10RL1 The student demonstrates comprehension by identifying evidence (i.e., examples of diction, imagery, point of view, figurative language, symbolism, plot events and main ideas) in a variety of texts representative of different genres (i.e., poetry, prose [short story, novel, essay, editorial, biography], and drama) and using this evidence as the basis for interpretation.

The student identifies, analyzes, and applies knowledge of the purpose, structure, and elements of nonfiction and/or informational materials and provides evidence from the text to support understanding; the student:

- a. Analyzes and explains the structures and elements of nonfiction works such as newspaper articles and editorials, magazine articles, journal articles, and/or other informational texts.

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

National Academic Standards (NATEF)

SC007 Analyzes/Evaluates Environmental Issues

- The technician develops and maintains an understanding of all federal, state, and local rules and regulations regarding environmental issues related to the work of the autobody technician. The technician uses such things as government impact statements, media information, and general knowledge of pollution and waste management to correctly use and dispose of products that result from the performance of a repair task.

SC012 Analyzes/Evaluates Environmental Issues Waste Management

- The technician evaluates the waste products resulting from an automobile body repair task and handles the disposal of materials in accordance with applicable federal, state, and local rules and regulations.

SC041- Applies and uses laboratory safety techniques.

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SC042- Applies and uses tables and graphs.

SC044- Applies and uses scientific method.

SC278 Describes/Explains Heat Fusion/Vaporization

- The technician can demonstrate an understanding of the effect of how adding heat causes a change in state of matter, such as from a solid to a liquid to a gas.

SC282 Describes/Explains Heat Temperature

- The technician can explain the differences between heat and temperature and demonstrate an understanding of how to measure each.

SC341 Describes/Explains Matter Phases/States

- The technician can explain in detail the three states of matter.

SC495 Measures Temperature Fahrenheit/Centigrade

- The technician uses direct and indirect methods to measure system temperatures and then converts them to Fahrenheit or Centigrade as required by the manufacturer for proper cure and application times.

SC496 Measures Time

- The technician uses direct and indirect methods to measure application times, mixing guidelines for certain products, and labor time guides for selected tasks.

MA026 Computes Addition Decimals

- The technician can add numbers that include decimals to determine conformance with the manufacturer's specifications.

MA028 Computes Addition Mentally

- The technician can mentally add two or more numbers to determine conformance with the manufacturer's specifications.

MA034 Computes Addition Whole Numbers

- The technician can add whole numbers to accurately determine measurement conformance with the manufacturer's specifications.

MA039 Computes Division Decimals

- The technician can divide decimals to determine measurement conformance with the manufacturer's specifications.

MA047 Computes Division Whole Numbers

- The technician can divide whole numbers to determine differences for comparison with the manufacturer's specifications.

MA065 Computes Multiplication Decimals

- The technician can multiply numbers that include decimals to determine conformance with the manufacturer's specifications.

MA067 Computes Multiplication Mentally

- The technician can mentally multiply numbers that include decimals to determine conformance with the manufacturer's specifications.

MA073 Computes Subtraction Whole Numbers

- The technician can subtract whole numbers to determine differences for comparison with the manufacturer's specifications.

MA084 Computes Subtraction Decimals

- The technician can subtract numbers that include decimals to determine conformance with the manufacturer's specifications.

MA086 Computes Subtraction Mentally

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- The technician can mentally subtract numbers to arrive at a difference for comparison with the manufacturer's specifications.

MA092 Computes Subtraction Whole Numbers

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MA126 Converts Units English/Metric -- Feet/Meters, e.g.

- The technician can measure/test with tools designed for English or metric measurements and then convert the resulting measurement to the system used by the manufacturers for specifying the correct measurement or tolerance.

MA161 Identifies English Measures Length/Volume/Weight

- The technician can determine the degree of conformance to the manufacturer's specifications for length, volume and any other appropriate measurements in the English system.

MA181 Measures Metric Distance

- The technician can measure distance using a variety of devices to determine conformance to the manufacturer's tolerances and specifications.

MA191 Measures Metric Temperature

- The technician can use metric temperature measurement instruments to determine ambient air temperature and that of paints and inhibitors.

MA190 Measures Metric Distance

- The technician can use metric measurement instruments to determine correct sizes or distances in the metric system.

MA191 Measures Metric Temperature

- The technician can use metric temperature measurement instruments to determine ambient air temperature and that of paints and inhibitors.

MA275 Identifies Temperatures Fahrenheit/Centigrade

- The technician can identify whether a temperature measurement should be made using a Fahrenheit or Centigrade measuring device.

LA038 Collects/Organizes Information-Oral/Written

- The technician collects and organizes oral and written information based on discussions, notes, observations, personal experiences, and data collection that will assist in the problem analysis and solution process.

LA069 Composes/Edits Notes

- The technician makes notes regarding symptoms, possible causes of problems, and other data that will aid in the diagnosis and problem solving process.

LA278 Uses Text Resources

- The technician uses text resources such as glossaries of terms, service manual indexes, database menus, and tables of contents to gather data for diagnosis and repair.

LA283 Uses Media Resources Databases

- The technician uses computerized and other databases to obtain system information.

LA285 Comprehends Information-Written Operator's Manual

- The technician can comprehend

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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.

Students will enhance reading in all curriculum areas by:

- q. 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.
- r. 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.

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- s. 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.
- t. 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.