

Implementation date
Fall 2010

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-SDR11-1 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.

- 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.

- 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.

Implementation date

Fall 2010

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.

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

Implementation date

Fall 2010

- 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.

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.

Implementation date

Fall 2010

- 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.)

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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.

Implementation date

Fall 2010

- b. Investigate rotational symmetry, including degree of rotation.
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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.

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

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- 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

Implementation date

Fall 2010

- 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.

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

Implementation date

Fall 2010

- 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.

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

Implementation date

Fall 2010

- 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), 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:

- 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.

Implementation date
Fall 2010

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

CTAE Foundation Skills

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

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

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

Implementation date

Fall 2010

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

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

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

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

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

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

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

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

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

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