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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.

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

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- 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.

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

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- 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):

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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.
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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.

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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.

- 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.

- 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.

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- 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, 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.
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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.
- 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

- 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.

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- 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.

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

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.

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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.

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.

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- 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.

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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.