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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 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.

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- 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.
- 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.

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- 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.

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):

- 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.

National Academic Standards (NATEF)

MA104- Calculates and evaluates precision measurement.

MA229- Solves problems generates conclusions.

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.

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- 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.

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

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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.

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.

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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

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.
- b. Discussing books

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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.
 - 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.

CTAE-FS-2 Academic Foundations: Learners achieve state academic

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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.