Course Title: Automotive Technology II

Course Description: Consists of two primary elements; Starting and Charging Systems covers the operation, testing and servicing of vehicle battery, starting and charging systems. Hybrid/ electric vehicle high voltage systems and safety are introduced. Brakes I and II examine hydraulic/ mechanical brake system fundamentals, diagnosis, and service in detail. The relationship between processor controls/ advanced electronics and hydraulic/ mechanical systems is explored with the introduction of ABS and regenerative braking theory and operation.

Equivalent CCNS Courses:

ASE123 Battery, Starting, and Charging
ASE110 Brakes I
ASE111 Automotive Brake Service II

Automotive Technology Enduring Understandings:

- Inquiry guides problem solving
- Parts impact whole
- Analysis of evidence influences performance

World Class Outcomes for Automotive Technology I:

- Investigate underlying academic principles and their applications across multiple disciplines
- Explore the applications of numerous technologies
- Collect and evaluate data to accurately analyze systems
- Apply appropriate technology to perform tasks accurately
- Perform tasks independently in a set time period, with minimal instruction.
- Perform tasks with 100% accuracy recognizing that no acceptable margin of error exists.
- Develop analysis driven concern resolutions
- Clearly communicate procedures both verbally and with written documentation.

Starting and Charging Systems CCNS and NATEF Tasks

1. Confirm proper battery capacity for vehicle application, perform battery capacity test; determine necessary action. FEMP.01.02.d, FEMP.01.02.e, FEMP.01.02.f, SC09-GR.HS-S.1-GLE.2-EO.b, RWC10-GR.12-S.2-GLE.2-EO.b

2. Maintain or restore electronic memory functions. FEMP.01.02.d, FEMP.01.02.e

3. Perform slow/fast battery charge according to manufacturer's recommendations. FEMP.01.02.d, FEMP.01.02.e

4. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. FEMP.01.02.d, FEMP.01.02.e, FEMP.01.02.k, FEMP.01.02.l, RWC10-GR.12-S.2-GLE.2-EO.b

5. Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures. FEMP.01.02.d, FEMP.01.02.e, FEMP.01.02.k, FEMP.01.02.l, RWC10-GR.12-S.2-GLE.2-EO.b

6. Perform starter current draw tests and circuit voltage drop tests; determine necessary action. FEMP.01.02.d, FEMP.01.02.e, RWC10-GR.12-S.2-GLE.2-EO.b

7. Inspect and test starter relays and solenoids; determine necessary action. FEMP.01.02.d, FEMP.01.02.e, RWC10-GR.12-S.2-GLE.2-EO.b

8. Remove and install starter in a vehicle. FEMP.01.02.e

9. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. FEMP.01.02.d, FEMP.01.02.e, RWC10-GR.12-S.2-GLE.2-EO.b

10. Inspect and test switches, connectors and wires of starter control circuits; determine necessary action. FEMP.01.02.d, FEMP.01.02.e, RWC10-GR.12-S.2-GLE.2-EO.b

11. Perform charging system output test; determine necessary action. FEMP.01.02.d, FEMP.01.02.e, RWC10-GR.12-S.2-GLE.2-EO.b

12. Inspect, adjust or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. FEMP.01.02.d, FEMP.01.02.e

13. Remove, inspect and re-install generator (alternator). FEMP.01.02.d, FEMP.01.02.e

14. Perform charging circuit voltage drop tests; determine necessary action. FEMP.01.02.d, FEMP.01.02.e, RWC10-GR.12-S.2-GLE.2-EO.b

15. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge or overcharge conditions. FEMP.01.02.d, FEMP.01.02.e, RWC10-GR.12-S.2-GLE.2-EO.b

Brakes I CCNS and NATEF Tasks

1. Measure brake pedal height, travel and free play as applicable; determine necessary action. FEMP.01.02.e, FEMP.01.02.f, MA10-GR.HS-S.1-GLE.2-EO.a.iii

2. Inspect brake lines, flexible hoses and fittings for leaks, dents, kinks, rust, cracks, bulging and wear; check for loose fittings and support; determine necessary action. FEMP.01.02.e

3. Select, handle, store and fill brake fluids to proper level. FEMP.01.02.d, FEMP.01.02.e, FEMP.01.02.f

4. Identify components of brake warning light system. FEMP.01.02.e

5. Bleed and or flush brake system. FEMP.01.02.d, FEMP.01.02.e, FEMP.01.02.f

6. Test brake fluid for contamination. FEMP.01.02.d, FEMP.01.02.e, FEMP.01.02.f

7. Check master cylinder for external leak and proper operation. FEMP.01.02.e

8. Remove, clean, inspect and measure brake drum diameter; determine necessary action. FEMP.01.02.d, FEMP.01.02.e

9. Remove, clean and inspect brake shoes, springs, pins, clips, levers, adjusters or self-adjusters, other related brake hardware and blocking support plates; lubricate and reassemble. FEMP.01.02.d FEMP.01.02.e

10. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. FEMP.01.02.d, FEMP.01.02.e

11. Pre-adjust brake shoes and parking brake; install brake drums or drum-hub assemblies and wheel bearings; perform final checks and adjustments. FEMP.01.02.d, FEMP.01.02.e

12. Install wheel and torque lug nuts. FEMP.01.02.e

13. Remove, clean, inspect repack and install wheel bearings, replace seals, install hub and adjust bearings. FEMP.01.02.d, FEMP.01.02.e

14. Check parking brake cables and components for wear, binding and corrosion; clean, lubricate, adjust or replace as needed. FEMP.01.02.e

15. Check parking brake operation and parking brake indicator light system operation; determine necessary action. FEMP.01.02.e

16. Check operation of brake stop light system. FEMP.01.02.e

17. Replace wheel bearing and race. FEMP.01.02.d, FEMP.01.02.e

18. Remove, inspect and replace pads and retaining hardware; determine necessary action. FEMP.01.02.d, FEMP.01.02.e

Automotive Brake Service II

1. Research applicable vehicle and service information, vehicle service history, service precautions and technical service bulletins. bulletins FEMP.01.02.j, FEMP.01.02.k, FEMP.01.02.l, RWC10-GR.12-S.2-GLE.2-EO.b

2. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). FEMP.01.02.e FEMP.01.02.f FEMP.01.02.k FEMP.01.02.l RWC10-GR.11-S.1-GLE.1-EO.b

3. Remove and clean caliper assembly, inspect for leaks and damage or wear to caliper housing; determine necessary action. FEMP.01.02.d, FEMP.01.02.e

4. Clean and inspect caliper mounting and slides or pins for proper operation, wear and damage; determine necessary action. FEMP.01.02.d, FEMP.01.02.e

5. Lubricate and re-install caliper, pads and related hardware; seat pads and inspect for leaks. FEMP.01.02.d, FEMP.01.02.e

6. Clean and inspect rotor; measure rotor thickness, thickness variation and lateral run out; determine necessary action. FEMP.01.02.d, FEMP.01.02.e MA10-GR.HS-S.1-GLE.2-EO.a.iii

7. Remove and re-install rotor. FEMP.01.02.e

8. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications. FEMP.01.02.d, FEMP.01.02.e MA10-GR.HS-S.1-GLE.2-EO.a.iii

9. Refinish rotor off-vehicle, measure final rotor thickness; determine necessary action. FEMP.01.02.d, FEMP.01.02.e MA10-GR.HS-S.1-GLE.2-EO.a.iii

10. Retract and re-adjust caliper piston on an integrated parking brake system. FEMP.01.02.d, FEMP.01.02.e

11. Check brake pad wear indicator; determine necessary action. FEMP.01.02.d, FEMP.01.02.e

12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. RWC10-GR.11-S.1-GLE.1-EO.b

13. Remove, inspect and replace pads and retaining hardware; compare with specifications. FEMP.01.02.d, FEMP.01.02.e

14. Refinish brake drum and measure final drum diameter. FEMP.01.02.d, FEMP.01.02.e MA10-GR.HS-S.1-GLE.2-EO.a.iii

15. Check brake pedal travel with and without engine running to verify proper power booster operation. FEMP.01.02.d, FEMP.01.02.e

16. Check vacuum supply and manifold or auxiliary pump to a vacuum-type power booster. FEMP.01.02.d, FEMP.01.02.e FEMP.01.02.h

17. Identify traction control vehicle stability control system components. FEMP.01.02.e FEMP.01.02.f FEMP.01.02.k FEMP.01.02.l

18. Describe the operation of a regenerative braking system. FEMP.01.02.e FEMP.01.02.f FEMP.01.02.k FEMP.01.02.l RWC10-GR.11-S.1-GLE.1-EO.b

NATEF, National Automotive Technicians Education Foundation

CDE Standards Descriptors

FEMP.01.02.c Execute repair plans for facilities and mobile equipment.

FEMP.01.02.d Understand the value and necessity of practicing personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.

FEMP.01.02.e Understand the safe and appropriate use of tools, equipment and work process.

FEMP.01.02.f Understand scientific principles in relation to chemical, mechanical and physical functions for various engine and vehicle systems.

FEMP.01.02.g Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.

FEMP.01.02.h Understand the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems.

FEMP.01.02.j Perform and document repair procedures in accordance with manufacturer recommendations and industry standards.

FEMP.01.02.k Demonstrate the effective use of computer based equipment to control electromechanical devices commonly used in diagnostic analysis.

FEMP.01.02.l Use technical vocabulary, technical reports and manuals, electronic systems and related technical data resources to determine repairs and estimates.

MA10-GR.HS-S.2-GLE.4-EO.a Create equations that describe numbers or relationships. (CCSS: A-CED)

MA10-GR.HS-S.1-GLE.2-EO.a.iii Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (CCSS: N-Q.3)

MA10-GR.HS-S.2-GLE.1-EO.b Interpret functions that arise in applications in terms of the context. (CCSS: F-IF)

RWC10-GR.12-S.2-GLE.2-EO.b Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem. (CCSS: RI.11-12.7)

RWC10-GR.11-S.1-GLE.1-EO.b Deliver formal oral presentations for intended purpose and audience, using effective verbal and nonverbal communication

SC09-GR.HS-S.1-GLE.2-EO.b Gather, analyze and interpret data on chemical and physical properties of elements such as density, melting point, boiling point, and conductivity

SC09-GR.HS-S.1-GLE.5-EO.c Use direct and indirect evidence to develop predictions of the types of energy associated with objects