

**COURSE OF STUDY
FOR**

Automotive Technology

Subject Code:

- **177000 – Ground Transportation Maintenance**
- **177002 – Ground Transportation Electrical/Electronics**
- **177003 – Automotive Braking, Suspension, and Steering Systems**
- **177006 – Automotive Engine Performance**

CTPD 066

Medina County Career Center

Medina, Ohio

ACKNOWLEDGMENTS

Automotive Technology

MEDINA COUNTY CAREER CENTER

Sincere appreciation goes to the following individuals for their assistance and cooperation in preparing this career and technical program's course of study:

- Mr. Steven H. Chrisman, Superintendent
- Mrs. Tresa Goodwin, Principal
- Mr. Jeffrey Hicks, Assistant Principal

Additional appreciation should also be given to the following for their help and assistance:

- Medina County Career Center Automotive Technology Advisory Committee
 - Bob Hess
 - Elio Martin
 - Chuck Stefanski
 - Rick Trunkett
 - Derrick Waller
- Medina County Career Center Board of Education

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RESOLUTION
Automotive Technology
MEDINA COUNTY CAREER CENTER

WHEREAS, the Automotive Technology Advisory Committee of the Medina County Career Center has reviewed the Automotive Technology Course of Study, and
WHEREAS, this Course of Study is based upon the Ohio Department of Education's Career Field Technical Competency Standards for Automotive Technology programs, and

WHEREAS, the Automotive Technology Advisory Committee has reviewed and modified these competencies and added competencies to address local labor market needs, and to acknowledge the school district's ability to offer specialized programs.

NOW, THEREFORE, BE IT RESOLVED, in accordance with the superintendent's recommendation, that the Medina County Career Center adopt the Automotive Technology Course of Study.

Approval Date: _____

District Superintendent
Steven H. Chrisman

Board President
Richie Muniak

**RECOMMENDATION OF PROGRAM BY
ADVISORY COMMITTEE
Automotive Technology**

MEDINA COUNTY CAREER CENTER

The Career Technical Advisory Committee of the Automotive Technology program, Medina County Career Center, has reviewed this course of study and recommends it for use as the foundation for instruction in classroom, laboratory, and cooperative occupational experiences.

The developers of the course of study have considered local labor market needs and the school district's ability to offer specialized programs. The competencies for this program have been reviewed and modified as being congruent with our school district's philosophy and student outcome measures. Additional competencies that relate to the Automotive Technology field have been incorporated into the course of study.

We believe that this course of study adequately and correctly focuses upon the development of technical competencies, attitudes, values and appreciations critical to successful employment in the Automotive Technology field.

The Automotive Technology Advisory Committee approved the course of study on

Date

Committee Chairperson

Business, Industry, Labor Member

Business, Industry, Labor Member

Business, Industry, Labor Member

Business, Industry, Labor Member

Business, Industry, Labor Member

Business, Industry, Labor Member

Business, Industry, Labor Member

DISTRICT PHILOSOPHY

Automotive Technology

MEDINA COUNTY CAREER CENTER

The Board of Education believes that the purpose of education in this district is to facilitate the development of the potential of each child to the fullest. The school staff seeks to recognize individual differences and to engender achievement and progress, not only in basic skills but also in the ability to think independently and critically.

The school staff is concerned with helping young people to understand what the American way of life means; to believe in it and to act democratically in their relationships with others; to develop in themselves attitudes of respect and helpfulness toward others; to want to, and be able to, perform well some portion of the work of the world and to acquire knowledge and skills necessary to do this with satisfaction to themselves and society; to understand and use effective methods in framing the questions and tackling the problems that they encounter in their lives to the end that they may function politically, economically and socially in a democratic society.

The “Statement of Philosophy” of this district shall be a living document, which reflects the contributions of staff members as well as the attitude and the direction of the Board of Education.

WE BELIEVE:

That each person should have the opportunity of developing potential talents in a manner compatible with interest and goals.

That every person should prepare to assume many roles during a life span, so that each may meet the challenges of a changing and complex society while continuously being a self-sustaining and contributing member of that society.

That each individual should be a craftsperson in attitude and skill with sincere appreciation for the health, safety and welfare of others.

That each individual should learn that there is dignity and beauty in any job that is performed well and with an attitude of pride.

That every individual should leave school with, at a minimum, saleable entry-level skills and the opportunity for proper employment.

That every person should understand that the educational demands of a complex changing society can only be dealt with through flexible, enthusiastic instructional leadership and in facilities which are constructed to meet the demands of that society.

DISTRICT GOALS **Automotive Technology**

MEDINA COUNTY CAREER CENTER

As a base against which to assess school needs and set objectives for the educational program, the Board of Education, following consultation with teaching staff members, students, parents and other residents of this District, adopts the following educational outcome goals for every student in this District.

- A. To provide a comprehensive academic and technical curriculum that is suited to students' needs and implemented through a combination of technical and academic instructors.
- B. To maintain and perpetuate open lines of communication with the business members of the community.
- C. To develop within the curriculum activities which promote good citizenship, leadership and democracy through participation in career/technical and service organizations.
- D. To provide for constant curriculum review and revision that maintains the current and future trends of the work world.
- E. To provide instruction as a means of preparing students for any future direction they may pursue.
- F. To provide the student the opportunity to develop acceptable work and safety habits and to assume responsibility for their personal actions.
- G. To encourage and personally assist each student to progress toward a positive attitude about school and the learning process.
- H. To assist each student to develop those attitudes, habits, values and skills that will enable them to acquire, maintain, and progress in their chosen field of employment.

- I. To develop pride in a job well done and a sense of satisfaction with the application of acquired skills.
- J. To continue to employ qualified and dedicated instructors to guide students in working toward their highest skills potential attainable.
- K. To obtain highly trained supervisors and administrators to assist in curriculum development, encourage creative teaching methods, and see that the finest teaching materials are supplied to the instructors.
- L. To continue to upgrade facilities to accommodate curriculum advancements and current developments in the trade areas consistent with Advisory Committee recommendations and high-tech changes in the business community.

EDUCATIONAL OUTCOME GOALS

The Board of Education believes that its mission is being (accomplished/achieved) when there is valid evidence that its educational programs and services are making it possible for students to achieve, commensurate with their ability and potential, one or more of the following outcomes:

- A. The academic and other educational goals established by the student's home district.
- B. Entry-level skills in a particular career field and the skills and attitudes to obtain further education and training in that field.
- C. Satisfactory performance of the skills associated with a particular course of study the student has completed.
- D. Enjoyment of the process of learning and commitment to continuous learning throughout one's lifetime.
- E. An understanding of, and the ability to cope with, change.
- F. An understanding of his/her own worth, abilities, potential, and limitations.
- G. The educational goals specified in Individualized Educational Plans (IEPs).

PROGRAM DESIGN

Automotive Technology

MEDINA COUNTY CAREER CENTER

PROGRAM GOALS

1. Develop core cluster and employability competencies that will enable students to enter and advance in a changing workplace. These competencies represent what individuals need to know and be able to be successful in post-secondary education, career, and life
2. To ready student for the world of automotive repair.
3. To challenge students to work with others in a team.
4. To prepare students for ASE testing certification.

PROGRAM OVERVIEW

The Automotive Technology Program is a two-year career technical program designed to prepare the student for the world of work in the Automotive Technology industry, along with preparing the student for lifelong learning. The student spends 2.5 hours daily in a combined lab and theory setting, and spends the remainder of the day in academic classes preparing the student for graduation.

POPULATION TO BE SERVED

The Medina County Career Center is open to students who have completed the 10th grade at the associate school. Special exceptions are made on a case-by-case basis as determined by the building principal.

HOUSING OF PROGRAM

The program is housed at the Medina County Career Center, and every effort is made to keep the program up to date on current industry trends. The school makes a continuing effort to keep all equipment and curriculum current with industry standards.

SUPERVISOR OF THE PROGRAM

The Automotive Technology is under the supervision of a designated member of the high school administrative team. All program requests are directed through the appropriate designated member of the high school administrative team.

OCCUPATIONS ADDRESSED BY THE PROGRAM

Automotive technician
Automotive technician's apprentice
Repair shop supervisor
Exhaust and emissions technician
Tune-up technician
Service writer
Mechanical unit repairer
Technician in automotive manufacturing plants
Air conditioning technician
Engine technician
Diesel technician
Bus inspector
Tractor technician
Parts salvager
Teacher or trainer

BASIC PROGRAM OPERATION

Provides classroom instruction and laboratory experiences in and out of school (including establishments related to Automotive Technology).

Develops fundamental knowledge, skills, abilities, values, and attitudes in entrepreneurship, leadership, and employability skills.

FIELD EXPERIENCE AND/OR EARLY PLACEMENT

Early Placement is available to all students who meet the following criteria: the recommendation of their career technical instructor, the assistant principal's recommendation, all fees paid in full, maintain a "C" average or better, appropriate attendance record, have a resume on file in the placement office, and have secured a job in an area related to your career technical program. All Early Placement will be determined on a case-by-case basis and may occur at any time of the year.

ARTICULATION AGREEMENTS

The Medina County Career Center maintains articulation agreements with many post-secondary institutions including but not limited to: Baldwin-Wallace College, Cuyahoga Community College, Lorain Community College, The Ohio State University, the University of Akron, University of Cincinnati, University of Northwestern Ohio, and Ursuline College.

ACADEMICS

In addition to technical programs, the Career Center offers a wide range of academic courses to not only prepare the students for graduation but also to provide for the opportunity for post-secondary education, should the student choose that option.

TECHNOLOGY

Computers are part of today's world, and they will continue to play an ever-increasing role in our daily lives. Technology education is extensive at the Career Center and computers are used in both Automotive Technology and academic areas. All equipment at the Career Center is state-of-the-art and continuously upgraded.

STUDENT LEADERSHIP

All students will be exposed to and encouraged to participate in their SkillsUSA. The Career Center also offers many other opportunities for students to expand their leadership skills through Key Club and various community service opportunities that the Career Center participates in.

CRITICAL THINKING AND DECISION MAKING

Students learn decision-making techniques through problem-solving approaches. Problem solving includes the identification of options, the selection of testing options, and determination of a solution or conclusion.

STATEMENT OF MODIFICATION

(N/A)

DISCLAIMER STATEMENT

This course of study conforms to all federal, state and local laws and regulations including Title IX and nondiscrimination against any student because of race, creed, sex, religion, citizenship, economic status, marital status, pregnancy, handicap, other physical characteristics, age or national origin. This policy of nondiscrimination shall also apply to otherwise qualified handicapped individuals.

SCOPE AND SEQUENCE

Automotive Technology

MEDINA COUNTY CAREER CENTER

Automotive Technician Program Outline

The following timeline will be used to deliver instruction in order to meet Automotive Service Excellence

JUNIOR YEAR

Ground Transportation Maintenance

In this first course, students will apply skills needed to inspect and perform general service on vehicles. Students will research applicable service information and technical service bulletins, and perform maintenance on vehicles. Students will inspect and service engine, drive train, suspension, steering, electrical and braking systems. Students will perform ignition maintenance including spark plug/glow plug and ignition wire and coil pack replacement. Additionally, students change fluids, filters and inspect vehicles for leaks and fluid condition.

Automotive Braking, Suspension, and Steering Systems (Undercarriage Systems)

Students will perform inspections, troubleshoot malfunctions and service automotive undercarriage systems. Students will identify poor performing hydraulic brake systems and replace malfunctioning components. Students will install coil and leaf springs, shock absorbers and struts, and replace wheel bearings. Students will inspect and replace automotive steering components and perform wheel alignments. Additionally, students will disable and enable supplemental restraint systems (SRS) and replace antilock brake systems components.

SENIOR YEAR

Ground Transportation Electrical/Electronics

Student will diagnose and repair vehicle electrical systems, including chassis electrical, charging, starting and lighting systems. Students will learn the fundamentals of direct current (DC) electronics including series, parallel, and series-parallel circuits. Students will use electronic diagnostic tools, read schematics, and utilize printed and electronic repair manuals to troubleshoot electrical circuits, test components and replace defective modules.

Automotive Engine Performance

Students will research vehicle service histories using model specific service bulletins. Students will test and diagnose for engine performance in fuel, air induction and exhaust systems using advanced testing procedures. Topics include computerized engine controls including retrieving and recording diagnostic trouble codes using On Board Diagnostics (OBD). Additionally, students will diagnose drivability and emissions problems resulting from malfunctions of interrelated systems.

Outcomes and Competencies

Each of the courses above is accompanied by a set of outcomes and competencies that students are expected to meet. Students achieve these competencies through not only specific course instruction but also through the integration of all of the technical, lab and academic work involved in the program. The complete list of outcomes and competencies for all of the possible courses in the Automotive Technology Program can be found on the Ohio Department of Education website at: <http://education.ohio.gov/Topics/Career-Tech/Transportation-Systems> (At this link, select High School “Transportation Systems Career Field Course Titles and Descriptions” in order to access the zip file containing the course competencies.)

The Automotive Technology Program also incorporates the National Automotive Technicians Education Foundation standards. The NATEF standards can be found at the following link and are listed below:

NATEF Standards

<http://www.natef.org/Achieving-Accreditation/Program-Standards.aspx>

NATEF MLR STANDARDS

2013 NATEF Automobile Accreditation

I. ENGINE REPAIR

A. General

- P-1 1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- P-1 2. Verify operation of the instrument panel engine warning indicators.
- P-1 3. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
- P-1 4. Install engine covers using gaskets, seals, and sealers as required.
- P-1 5. Remove and replace timing belt; verify correct camshaft timing.
- P-1 6. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
- P-3 7. Identify hybrid vehicle internal combustion engine service precautions.

I. ENGINE REPAIR

B. Cylinder Head and Valve Train

- P-1 1. Adjust valves (mechanical or hydraulic lifters).

I. ENGINE REPAIR

C. Lubrication and Cooling Systems

- P-1 1. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core and galley plugs; determine necessary action.
- P-1 2. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
- P-1 3. Remove, inspect, and replace thermostat and gasket/seal.
- P-1 4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.
- P-1 5. Perform engine oil and filter change.

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

A. General

- P-1 1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
- P-1 2. Check fluid level in a transmission or a transaxle equipped with a dip-stick.
- P-1 3. Check fluid level in a transmission or a transaxle not equipped with a dip-stick.
- P-2 4. Check transmission fluid condition; check for leaks.

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

B. In-Vehicle Transmission/Transaxle

- P-2 1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
- P-2 2. Inspect for leakage at external seals, gaskets, and bushings.
- P-2 3. Inspect replace and align power train mounts.
- P-1 4. Drain and replace fluid and filter(s).

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

C. Off-Vehicle Transmission and Transaxle

- P-3 1. Describe the operational characteristics of a continuously variable transmission (CVT).
- P-3 2. Describe the operational characteristics of a hybrid vehicle drive train.

III. MANUAL DRIVE TRAIN AND AXLES

A. General

- P-1 1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
- P-1 2. Drain and refill manual transmission/transaxle and final drive unit.
- P-2 3. Check fluid condition; check for leaks.

III. MANUAL DRIVE TRAIN AND AXLES

B. Clutch

- P-1 1. Check and adjust clutch master cylinder fluid level.
- P-1 2. Check for system leaks.

III. MANUAL DRIVE TRAIN AND AXLES

C. Transmission/Transaxle

- P-3 1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.

III. MANUAL DRIVE TRAIN AND AXLES

D. Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints

- P-2 1. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.
- P-2 2. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.

III. MANUAL DRIVE TRAIN AND AXLES

E. Differential Case Assembly

- P-2 1. Clean and inspect differential housing; check for leaks; inspect housing vent.
- P-1 2. Check and adjust differential housing fluid level.
- P-1 3. Drain and refill differential housing.

E.1 Drive Axles

- P-2 1. Inspect and replace drive axle wheel studs.

III. MANUAL DRIVE TRAIN AND AXLES

F. Four-wheel Drive/All-wheel Drive

- P-3 1. Inspect front-wheel bearings and locking hubs.
- P-2 2. Check for leaks at drive assembly seals; check vents; check lube level.

IV. SUSPENSION AND STEERING SYSTEMS

A. General

- P-1 1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- P-1 2. Disable and enable supplemental restraint system (SRS).

IV. SUSPENSION AND STEERING

B. Related Suspension and Steering Service

- P-1 1. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
- P-1 2. Determine proper power steering fluid type; inspect fluid level and condition.
- P-2 3. Flush, fill, and bleed power steering system.

- P-1 4. Inspect for power steering fluid leakage; determine necessary action.
- P-1 5. Remove, inspect, replace, and adjust power steering pump drive belt.
- P-2 6. Inspect and replace power steering hoses and fittings.
- P-1 7. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
- P-1 8. Inspect tie rod ends (sockets), tie rod sleeves, and clamps.
- P-1 9. Inspect upper and lower control arms, bushings, and shafts.
- P-1 10. Inspect and replace rebound and jounce bumpers.
- P-1 11. Inspect track bar, strut rods/radius arms, and related mounts and bushings.
- P-1 12. Inspect upper and lower ball joints (with or without wear indicators).
- P-1 13. Inspect suspension system coil springs and spring insulators (silencers).
- P-1 14. Inspect suspension system torsion bars and mounts.
- P-1 15. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.
- P-1 16. Inspect strut cartridge or assembly.
- P-1 17. Inspect front strut bearing and mount.
- P-1 18. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.
- P-1 19. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
- P-1 20. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
- P-3 21. Inspect electric power-assisted steering.
- P-2 22. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
- P-3 23. Describe the function of the power steering pressure switch.

IV. SUSPENSION AND STEERING

C. Wheel Alignment

- P-1 1. Perform prealignment inspection and measure vehicle ride height; determine necessary action.

IV. SUSPENSION AND STEERING

D. Wheels and Tires

- P-1 1. Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action.
- P-1 2. Rotate tires according to manufacturer's recommendations.
- P-1 3. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
- P-2 4. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
- P-1 5. Inspect tire and wheel assembly for air loss; perform necessary action.
- P-1 6. Repair tire using internal patch.
- P-2 7. Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps.

- P-2 8. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.

V. BRAKES

A. General

- P-1 1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- P-1 2. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).
- P-1 3. Install wheel and torque lug nuts.

V. BRAKES

B. Hydraulic System

- P-1 1. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.
- P-1 2. Check master cylinder for external leaks and proper operation.
- P-1 3. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action.
- P-1 4. Select, handle, store, and fill brake fluids to proper level.
- P-3 5. Identify components of brake warning light system.
- P-1 6. Bleed and/or flush brake system.
- P-1 7. Test brake fluid for contamination.

V. BRAKES

C. Drum Brakes

- P-1 1. Remove, clean, inspect, and measure brake drum diameter; determine necessary action.
- P-1 2. Refinish brake drum and measure final drum diameter; compare with specifications.
- P-1 3. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
- P-2 4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
- P-2 5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.

V. BRAKES

D. Disc Brakes

- P-1 1. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
- P-1 2. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.
- P-1 3. Remove, inspect, and replace pads and retaining hardware; determine necessary action.

- P-1 4. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
- P-1 5. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action.
- P-1 6. Remove and reinstall rotor.
- P-1 7. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
- P-1 8. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
- P-3 9. Retract and re-adjust caliper piston on an integral parking brake system.
- P-2 10. Check brake pad wear indicator; determine necessary action.
- P-1 11. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.

V. BRAKES

E. Power-Assist Units

- P-2 1. Check brake pedal travel with, and without, engine running to verify proper power booster operation.
- P-1 2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.

V. BRAKES

F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)

- P-1 1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.
- P-2 2. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.
- P-1 3. Check parking brake operation and parking brake indicator light system operation; determine necessary action.
- P-1 4. Check operation of brake stop light system.
- P-2 5. Replace wheel bearing and race.
- P-1 6. Inspect and replace wheel studs.

V. BRAKES

G. Electronic Brakes, and Traction and Stability Control Systems

- P-3 1. Identify traction control/vehicle stability control system components.
- P-3 2. Describe the operation of a regenerative braking system.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

A. General

- P-1 1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- P-1 2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
- P-1 3. Use wiring diagrams to trace electrical/electronic circuits.

- P-1 4. Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
- P-2 5. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
- P-2 6. Check operation of electrical circuits with a test light.
- P-2 7. Check operation of electrical circuits with fused jumper wires.
- P-1 8. Measure key-off battery drain (parasitic draw).
- P-1 9. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
- P-1 10. Perform solder repair of electrical wiring.
- P-1 11. Replace electrical connectors and terminal ends.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

B. Battery Service

- P-1 1. Perform battery state-of-charge test; determine necessary action.
- P-1 2. Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.
- P-1 3. Maintain or restore electronic memory functions.
- P-1 4. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
- P-1 5. Perform slow/fast battery charge according to manufacturer's recommendations.
- P-1 6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
- P-3 7. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
- P-1 8. Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
- P-3 9. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

C. Starting System

- P-1 1. Perform starter current draw test; determine necessary action.
- P-1 2. Perform starter circuit voltage drop tests; determine necessary action.
- P-2 3. Inspect and test starter relays and solenoids; determine necessary action.
- P-1 4. Remove and install starter in a vehicle.
- P-2 5. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

D. Charging System

- P-1 1. Perform charging system output test; determine necessary action.
- P-1 2. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.

- P-2 3. Remove, inspect, and re-install generator (alternator).
- P-1 4. Perform charging circuit voltage drop tests; determine necessary action.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

E. Lighting Systems

- P-1 1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
- P-2 2. Aim headlights.
- P-2 3. Identify system voltage and safety precautions associated with high-intensity discharge headlights.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

F. Accessories

- P-1 1. Disable and enable airbag system for vehicle service; verify indicator lamp operation.
- P-1 2. Remove and reinstall door panel.
- P-3 3. Describe the operation of keyless entry/remote-start systems.
- P-1 4. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
- P-1 5. Verify windshield wiper and washer operation; replace wiper blades.

VII. HEATING AND AIR CONDITIONING

A. General

- P-1 1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.

VII. HEATING AND AIR CONDITIONING

B. Refrigeration System Components

- P-1 1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
- P-2 2. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.
- P-1 3. Inspect A/C condenser for airflow restrictions; determine necessary action.

VII. HEATING AND AIR CONDITIONING

C. Heating, Ventilation, and Engine Cooling Systems

- P-1 1. Inspect engine cooling and heater systems hoses; perform necessary action.

VII. HEATING AND AIR CONDITIONING

D. Operating Systems and Related Controls

- P-1 1. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.
- P-2 2. Identify the source of A/C system odors.

VIII. ENGINE PERFORMANCE

A. General

- P-1 1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- P-1 2. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action
- P-2 3. Perform cylinder power balance test; determine necessary action.
- P-1 4. Perform cylinder cranking and running compression tests; determine necessary action.
- P-1 5. Perform cylinder leakage test; determine necessary action.
- P-1 6. Verify engine operating temperature.
- P-1 7. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

VIII. ENGINE PERFORMANCE

B. Computerized Controls

- P-1 1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
- P-1 2. Describe the importance of operating all OBDII monitors for repair verification.

VIII. ENGINE PERFORMANCE

C. Fuel, Air Induction, and Exhaust Systems

- P-1 1. Replace fuel filter(s)
- P-1 2. Inspect, service, or replace air filters, filter housings, and intake duct work.
- P-1 3. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.
- P-1 4. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed.
- P-3 5. Check and refill diesel exhaust fluid (DEF).

VIII. ENGINE PERFORMANCE

D. Emissions Control Systems

- P-2 1. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.

REQUIRED SUPPLEMENTAL TASKS

Shop and Personal Safety

1. Identify general shop safety rules and procedures.
2. Utilize safe procedures for handling of tools and equipment.
3. Identify and use proper placement of floor jacks and jack stands.
4. Identify and use proper procedures for safe lift operation.
5. Utilize proper ventilation procedures for working within the lab/shop area.
6. Identify marked safety areas.
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
8. Identify the location and use of eye wash stations.
9. Identify the location of the posted evacuation routes.
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
11. Identify and wear appropriate clothing for lab/shop activities.
12. Secure hair and jewelry for lab/shop activities.
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

Tools and Equipment

1. Identify tools and their usage in automotive applications.
2. Identify standard and metric designation.
3. Demonstrate safe handling and use of appropriate tools.
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, and dial-caliper).

Preparing Vehicle for Service

1. Identify information needed and the service requested on a repair order.
2. Identify purpose and demonstrate proper use of fender covers, mats.
3. Demonstrate use of the three C's (concern, cause, and correction).
4. Review vehicle service history.

5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

Preparing Vehicle for Customer

1. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

Junior Fall Semester

Subject Code: 177000

Ground Transportation Maintenance

In this first course, students will apply skills needed to inspect and perform general service on vehicles. Students will research applicable service information and technical service bulletins, and perform maintenance on vehicles. Students will inspect and service engine, drive train, suspension, steering, electrical and braking systems. Students will perform ignition maintenance including spark plug/glow plug and ignition wire and coil pack replacement.

Additionally, students change fluids, filters and inspect vehicles for leaks and fluid condition.

WEEK 1

Outcome 1.1. **REQUIRED Employability Skills:** Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

***Strategies for Teaching and Learning**

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies 1.1.1.

- 1.1.1. Identify the knowledge, skills and abilities necessary to succeed in careers.
- 1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure and experience.
- 1.1.3. Develop a career plan that reflects career interests, pathways and secondary and postsecondary options.
- 1.1.4. Describe the role and function of professional organizations, industry associations and organized labor and use networking techniques to develop and maintain professional relationships.

- 1.1.5. Develop strategies for self-promotion in the hiring process (e.g., filling out job applications, résumé writing, interviewing skills, portfolio development).
- 1.1.6. Explain the importance of work ethic, accountability and responsibility and demonstrate associated behaviors in fulfilling personal, community and workplace roles.
- 1.1.7. Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions.
- 1.1.8. Identify the correlation between emotions, behavior and appearance and manage those to establish and maintain professionalism.
- 1.1.9. Give and receive constructive feedback to improve work habits.
- 1.1.10. Adapt personal coping skills to adjust to taxing workplace demands.
- 1.1.11. Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them.
- 1.1.12. Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior.

WEEK 2

Outcome 2.1. Facility Safety: Handle materials, prevent accidents, and mitigate hazards.

***Strategies for Teaching and Learning**

Today's class Safety course, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 2.1.2. Identify and communicate hazards associated with slippery surfaces and lighting.
- 2.1.6. Identify and eliminate workplace clutter and maintain clearance and boundaries.
- 2.1.8. Identify procedures for handling, storage, and disposal of hazardous materials.
- 2.1.9. Identify the locations of emergency flush showers, eyewash fountains, Material Safety Data Sheets (MSDSs), fire alarms, and exits.
- 2.1.11. Select and operate fire extinguishers based on the class of fire.
- 2.1.12. Conduct safety inspection of workspace.
- 2.1.14. Inspect air and exhaust systems, intake filters, fans, and other mechanical components

Outcome 2.2 Personal Safety: Practice personal safety.

***Strategies for Teaching and Learning**

Today's class Safety course, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 2.2.2. Describe the risk factors associated with working under the influence of drugs and alcohol and how it increases the risk of accident, lowers productivity, raises insurance costs, and reduces profits.
- 2.2.3. Select, use, maintain, and dispose of Personal Protective Equipment (PPE) appropriate to job tasks, conditions, and materials.
- 2.2.4. Identify workplace risk factors associated with repetitive motion and lifting, operating, and moving heavy objects.
- 2.2.5. Demonstrate appropriate body mechanics in lifting and moving heavy objects.

WEEK 3

Outcome 1.2. **REQUIRED Leadership and Communications:** Process, maintain, evaluate, and disseminate information in a business. Develop leadership and team building to promote collaboration.

***Strategies for Teaching and Learning**

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.2.1. Extract relevant, valid information from materials and cite sources of information.
- 1.2.2. Deliver formal and informal presentations.
- 1.2.3. Identify and use verbal, nonverbal, and active listening skills to communicate effectively.
- 1.2.4. Use negotiation and conflict-resolution skills to reach solutions.
- 1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
- 1.2.6. Use proper grammar and expression in all aspects of communication.
- 1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
- 1.2.8. Identify the strengths, weaknesses, and characteristics of leadership styles that influence internal and external workplace relationships.
- 1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g., common content for large audience, control of tone, speed, cost, lack of non-verbal cues, potential for forwarding information, longevity).
- 1.2.10. Use interpersonal skills to provide group leadership, promote collaboration, and work in a team.
- 1.2.11. Write professional correspondence, documents, job applications, and résumés.
- 1.2.12. Use technical writing skills to complete forms and create reports.

- 1.2.13. Identify stakeholders and solicit their opinions.
- 1.2.14. Use motivational strategies to accomplish goals.

WEEK 4

Outcome 1.3. **REQUIRED Business Ethics and Law:** Analyze how professional, ethical, and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

***Strategies for Teaching and Learning**

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.3.1. Analyze how regulatory compliance affects business operations and organizational performance.
- 1.3.2. Follow protocols and practices necessary to maintain a clean, safe, and healthy work environment.
- 1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).
- 1.3.4. Identify how federal and state consumer protection laws affect products and services.
- 1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], U.S. Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.
- 1.3.6. Identify deceptive practices (e.g., bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.
- 1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission).
- 1.3.8. Verify compliance with computer, copyright, and intellectual property laws and regulations.
- 1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational, and professional ethical standards.

WEEK 5

***Strategies for Teaching and Learning**

Outcome 1.4.

REQUIRED Knowledge Management and Information Technology: Demonstrate current and emerging strategies and technologies used to collect, analyze, record, and share information in business operations.

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).
- 1.4.2. Select and use software applications to locate, record, analyze, and present information (e.g., word processing, electronic mail, spreadsheet, databases, presentation, Internet search engines).
- 1.4.3. Verify compliance with security rules, regulations, and codes (e.g., property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to industry pathway.
- 1.4.4. Use system hardware to support software applications.
- 1.4.5. Use information technology tools to maintain, secure, and monitor business records.
- 1.4.6. Use electronic database to access and create business and technical information.
- 1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g., lists, calendars, address books).
- 1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

WEEK 5

***Strategies for Teaching and Learning**

Outcome 1.5.

REQUIRED Global Environment: Evaluate how beliefs, values, attitudes, and behaviors influence organizational strategies and goals.

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.5.1. Describe how cultural understanding, cultural intelligence skills, and continual awareness are interdependent.
- 1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an organization.
- 1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.

WEEK 7

Outcome 1.7. **OPTIONAL Entrepreneurship/Entrepreneurs:** Analyze the environment in which a business operates and the economic factors and opportunities associated with self-employment.

***Strategies for Teaching and Learning**

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.7.1. Compare and contrast the four types of business ownership (i.e., individual proprietorships, partnerships, corporations, cooperatives).
- 1.7.2. Explain the role of profit as the incentive to entrepreneurs in a market economy.
- 1.7.3. Identify the factors that contribute to the success and failure of entrepreneurial ventures.
- 1.7.4. Assess the roles of nonprofit, not-for-profit, and for-profit businesses.
- 1.7.5. Develop a business plan.
- 1.7.6. Describe life cycles of an entrepreneurial business and an entrepreneur.
- 1.7.7. Create a list of personal strengths, weaknesses, skills, and abilities needed to be successful as an entrepreneur.
- 1.7.8. Explain pathways used to become an entrepreneur.
- 1.7.9. Conduct self-assessment to determine entrepreneurial potential.
- 1.7.10. Describe techniques for obtaining experience (e.g., apprenticeship, co-operative [co-op] education, work placement, internship, job shadowing) related to an entrepreneurial objective.
- 1.7.11. Identify initial steps in establishing a business (e.g., LLC, tax ID, permits, insurance, licensing).
- 1.7.12. Identify resources available to entrepreneurs (e.g., Small Business Administration, mentors, information resources, educational opportunities).
- 1.7.13. Protect intellectual property and knowledge (e.g., copyright, patent, trademark, trade secrets, and processes).

WEEK 8

Outcome 1.8. **OPTIONAL Operations Management:** Plan, organize, and monitor an organization or department to maximize contribution to organizational goals and objectives.

***Strategies for Teaching and Learning**

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.8.1. Forecast future resources and budgetary needs using financial documents (e.g., balance sheet, demand forecasting, financial ratios).
- 1.8.2. Select and organize resources to develop a product or a service.
- 1.8.3. Analyze the performance of organizational activities and reallocate resources to achieve established goals.
- 1.8.4. Identify alternative actions to take when goals are not met (e.g., changing goals, changing strategies, efficiencies).
- 1.8.5. Use inventory and control systems to purchase materials, supplies, and equipment (e.g., Last In, First Out [LIFO]; First In, First Out [FIFO]; Just in Time [JIT]; LEAN).
- 1.8.6. Identify the advantages and disadvantages of carrying cost and Just in Time (JIT) production systems and the effects of monitoring inventory (e.g., perishable, shrinkage, insurance) on profitability.
- 1.8.7. Collect information and feedback to help assess the organization's strategic planning and policymaking processes.
- 1.8.8. Identify routine activities for maintaining business facilities and equipment.
- 1.8.9. Develop a budget that reflects the strategies and goals of the organization.
- 1.8.10. Analyze how business management and environmental management systems (e.g., health, safety) contribute to continuous improvement and sustainability.

WEEK 9

Outcome 1.9. REQUIRED Financial Management: Use financial tools, strategies, and systems to develop, monitor, and control the use of financial resources to ensure personal and business financial well-being.

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Today's class Automotive Service, power point, notes, videos and discussion

*Key Assessments for Student Learning

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.9.1. Create, analyze, and interpret financial documents (e.g., budgets, income statements).
- 1.9.2. Identify tax obligations
- 1.9.3. Review and summarize savings, investment strategies, and purchasing options (e.g., cash, lease, finance, stocks, bonds).
- 1.9.4. Identify credit types and their uses in order to establish credit.
- 1.9.5. Identify ways to avoid or correct debt problems.
- 1.9.6. Explain how credit ratings and the criteria lenders use to evaluate repayment capacity affect access to loans.

- 1.9.7. Review and summarize categories (types) of insurance and identify how insurances can reduce financial risk.
- 1.9.8. Identify income sources and expenditures.
- 1.9.9. Compare and contrast different banking services available through financial institutions.
- 1.9.10. Identify the role of depreciation in tax planning and liability.

WEEK 10

Outcome 1.10. **OPTIONAL Sales and Marketing:** Manage pricing, place, promotion, packaging, positioning, and public relations to improve quality customer service.

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Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.10.1. Identify how the roles of marketing, sales, advertising, and public relations contribute to a company's brand.
- 1.10.2. Determine the customer's needs and identify solutions.
- 1.10.3. Communicate features, benefits, and warranties of a product or service to the customer.
- 1.10.4. Identify the company policies and procedures for initiating product and service improvements.
- 1.10.5. Monitor customer expectations by using measurement tools to ensure product or service satisfaction.
- 1.10.6. Discuss the importance of correct pricing to support a product's or service's positioning in the marketing mix.
- 1.10.7. Describe the importance and diversity of distribution chains (e.g., intensive, selective, exclusive) to sell a product.
- 1.10.8. Use promotional techniques to maximize sales revenues (e.g., advertising, sales promotions, publicity, public relations, create new sales channels, create new products).
- 1.10.9. Use product management (e.g., product mix, product line, bundling) to maximize sales revenues, market share, and profit margins.
- 1.10.10. Demonstrate sales techniques.

WEEK 11

Outcome 1.11. **OPTIONAL Principles of Business Economics:** Examine and employ economic principles, concepts, and policies to accomplish organizational goals and objectives.

***Strategies for Teaching and Learning**

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 1.11.1. Identify the economic principles that guide geographic location of an industry's facilities (e.g., manufacturing, administration, supply chain).
- 1.11.2. Identify the difference between monetary and nonmonetary incentives and explain how changes in incentives cause changes in behavior.
- 1.11.3. Use economic indicators to measure economic trends and conditions (e.g., relative scarcity, price, quantity of products and services).
- 1.11.4. Determine how the quality, quantity, and pricing of goods and services are affected by domestic and international competition in a market economy.
- 1.11.5. Analyze factors that affect currency and exchange rates.
- 1.11.6. Explain how financial markets and government policies influence interest rates (credit ratings/debt ceiling), trade deficits, and unemployment.
- 1.11.7. Describe how economic performance and culture are interdependent.
- 1.11.8. Identify the relationships between economy, society, and environment that lead to sustainability.
- 1.11.9. Describe how laws and regulations influence domestic and international trade.

WEEK 12

Outcome 2.3. Tool and Equipment Preventive Maintenance: Identify, use, clean, maintain, and perform planned preventive maintenance on tools and equipment.

***Strategies for Teaching and Learning**

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 2.3.1. Identify the types of hand tools, power tools, and stationary equipment and describe their function.
- 2.3.2. Identify potential hazards and limitations related to the use of hand tools, power tools, and stationary equipment.
- 2.3.3. Operate power tools and stationary equipment in accordance with established procedures and safety standards.
- 2.3.4. Ensure the presence and functionality of safety systems and hardware.
- 2.3.5. Clean, lubricate, and adjust power tools and stationary equipment.

Outcome 2.4. **General Maintenance:** Provide general maintenance to mechanical systems.

Competencies

- 2.4.1. Inspect for leakage at seals, gaskets, and bushings.
- 2.4.2. Inspect fluid levels and fluid conditions on all mechanical systems.
- 2.4.3. Select engine, powertrain, power steering, and brake system fluids based on characteristics and applications.
- 2.4.4. Describe characteristics of engine fuels and fuel additives.
- 2.4.5. Perform engine oil and filter change.
- 2.4.6. Replace fuel filters.
- 2.4.7. Flush and fill engine cooling system.
- 2.4.8. Inspect, service, or replace air filters, filter housings, and intake ductwork.
- 2.4.9. Drain and replace drivetrain fluids and filters.
- 2.4.10. Flush, fill, and bleed power steering system and replace filters.
- 2.4.11. Flush, fill, and bleed brake system.
- 2.4.12. Store mechanical systems fluids and waste products.
- 2.4.13. Inspect and replace drive belts.
- 2.4.14. Identify the sources of air conditioner (A/C) system odors.
- 2.4.15. Inspect and service battery and battery cables, connectors, clamps, and hold downs.
- 2.4.16. Inspect interior and exterior lamps and sockets.
- 2.4.17. Verify operation of instrument panel gauges and warning/indicator lights and reset maintenance indicators.
- 2.4.18. Verify windshield wiper and washer operations, replace wiper blades, and refill washer reservoir (where applicable).
- 2.4.19. Inspect, repair to industry standards, and rotate tires and reset the tire pressure monitor system (TPMS).

WEEK 13

Outcome 3.5.7 **Lubrication and Cooling Systems:** Inspect lubrication and cooling systems operation.

***Strategies for Teaching and Learning**

Today's class Automotive Service, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 3.5.7. Test, drain, flush, and refill coolant and bleed cooling system.

WEEK 14

Outcome 4.6. **Batteries: Diagnosis and service batteries.**

***Strategies for Teaching and Learning**

Today's class MLR steering and suspension, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 5.8.1. Identify tire wear patterns and tire construction.
- 5.8.2. Identify bearing noises and wheel vibration, shimmy, and noise.
- 5.8.3. Measure wheel, tire, axle, and hub runout.
- 5.8.4. Balance wheel and tire assembly.
- 5.8.5. Remove, inspect, and reinstall tire and wheel assembly and calibrate tire pressure monitoring system.
- 5.8.6. Inspect and replace wheel studs.

WEEK 18-20

Outcome 5.5. Steering: Identify steering system components.

***Strategies for Teaching and Learning**

Today's class MLR steering and suspension, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 5.5.1. Disable and enable supplemental restraint system (SRS).
- 5.5.2. Remove and replace steering wheel and center and time supplemental restraint system (SRS) coil (clock spring).
- 5.5.3. Inspect steering shaft universal joints and flexible couplings.
- 5.5.4. Remove, inspect, replace, and adjust power steering pump belt, power steering pump, power steering pump pulley, hoses, and fittings and check pulley and belt alignment.
- 5.5.5. Inspect and replace pitman arm, relay rod (centerlink/intermediate), idler arm and mountings, and steering linkage damper.
- 5.5.6. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.

Outcome 5.6. Suspension: Remove, inspect and install front and rear suspension.

Competencies

- 5.6.1. Identify short arm and long arm suspension system components.
- 5.6.2. Identify strut suspension system components.

- 5.6.3. Remove, inspect, and install upper and lower control arms, bushings, shafts, upper and lower ball joints, and rebound bumpers.
- 5.6.4. Remove, inspect, and install strut rods (compression and tension) and bushings.
- 5.6.5. Remove, inspect, and install steering knuckle assemblies.
- 5.6.6. Remove, inspect, and install short arm and long arm suspension system coil springs and spring insulators.
- 5.6.7. Remove, inspect, install, and adjust suspension system torsion bars and stabilizer bar bushings, brackets, and links and inspect mounts.
- 5.6.8. Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.
- 5.6.9. Remove, inspect, and install transverse links, control arms, bushings, and mounts.
- 5.6.10. Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
- 5.6.11. Inspect, remove, and replace shock absorbers.

Outcome 5.7 **Wheel Alignment:** Inspect and adjust wheel alignment.

WEEK 21-26

***Strategies for Teaching and Learning**

Today's class MLR steering and suspension, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 5.7.1. Inspect, remove, and replace shock absorbers and inspect mounts and bushings.
- 5.7.2. Replace front and rear wheel bearings.
- 5.7.3. Identify vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, ride height, and steering return concerns.
- 5.7.4. Check and adjust wheel caster, camber, and toe and center the steering wheel.

WEEK 27-28

Outcome 4.1. **Hydraulic Brake Systems:** Identify, inspect, and replace hydraulic components of brake systems.

***Strategies for Teaching and Learning**

Today's class MLR Brakes, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

WEEK 34-36

Outcome 4.4. **Antilock Brakes:** Identify, inspect, and replace antilock brake systems.

***Strategies for Teaching and Learning**

Today's class MLR Brakes, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 4.4.1. Identify and inspect antilock brake system (ABS) components.
- 4.4.2. Identify poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the ABS.
- 4.4.3. Identify ABS braking concerns caused by vehicle modifications (e.g., tire size, curb height, final drive ratio).
- 4.4.4. Identify ABS electronic controls and components.
- 4.4.5. Depressurize high-pressure components and bleed front and rear hydraulic circuits.
- 4.4.6. Re-adjust caliper piston on an integral parking brake system.
- 4.4.7. Remove and install ABS electrical and/or electronic and hydraulic components.
- 4.4.8. Interpret output signal, resistance charts to voltage/ground, and frequency data.
- 4.4.9. Identify traction control and/or vehicle stability control system components.

Senior Fall Semester

Subject Code: 177002

Ground Transportation Electrical/Electronics

Student will diagnose and repair vehicle electrical systems, including chassis electrical, charging, starting and lighting systems. Students will learn the fundamentals of direct current (DC) electronics including series, parallel, and series parallel circuits. Students will use electronic diagnostic tools, read schematics, and utilize printed and electronic repair manuals to troubleshoot electrical circuits, test components and replace defective modules.

WEEK 1

Outcome 2.4. **General Maintenance:** Provide general maintenance to mechanical systems.

***Strategies for Teaching and Learning**

Today's class MLR Electrical power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 2.4.15. Inspect and service battery and battery cables, connectors, clamps, and hold downs.
- 2.4.16. Inspect interior and exterior lamps and sockets.
- 2.4.17. Verify operation of instrument panel gauges and warning/indicator lights and reset maintenance indicators.

Week 2-4

Outcome 4.5. **Electrical and Electronic Systems:** Diagnose the electrical and electronic integrity of series, parallel, and series-parallel circuits using principles of electricity (e.g., Ohm's Law, Watt's Law).

***Strategies for Teaching and Learning**

Today's class, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 4.5.1. Interpret wiring diagrams of electrical circuits.
- 4.5.2. Measure source voltage and perform voltage drop tests in electrical and electronic circuits.
- 4.5.3. Measure current, continuity, and resistance.
- 4.5.4. Identify capacitance and inductance.
- 4.5.5. Inspect and test switches, connectors, relays, solenoid, solid state devices, and wires of electrical and electronic circuits.
- 4.5.6. Remove and repair or replace terminal connectors.
- 4.5.7. Perform solder repair of electrical wiring.
- 4.5.8. Locate shorts, grounds, opens, and resistance problems in electrical and electronic circuits.
- 4.5.9. Measure and diagnose the causes of excessive key-off battery drain (parasitic draw).
- 4.5.10. Inspect, test, and replace or reset fusible links, circuit breakers, and fuses.

WEEK 5

Outcome 4.6. **Batteries: Diagnosis and service batteries.**

***Strategies for Teaching and Learning**

Today's class, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 4.6.1. Identify battery construction and principles of operation.
- 4.6.2. Test battery performance using state-of-charge and conductance tests and record test results.
- 4.6.3. Confirm proper battery capacity for vehicle application and perform battery capacity test.
- 4.6.4. Maintain or restore electronic memory functions.
- 4.6.5. Perform a battery charge.
- 4.6.6. Start a vehicle using jumper cables and a battery or auxiliary power supply using manufacturer's jumping techniques and precautions.
- 4.6.7. Remove and replace battery.

WEEK 6-7

Outcome 4.7. Starting and Charging Systems: Identify, inspect, and replace starting and charging system components.

***Strategies for Teaching and Learning**

Today's class, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 4.7.1. Differentiate between electrical and engine mechanical problems that cause a slow crank or no crank condition.
- 4.7.2. Inspect, test, and replace low and high current side components.
- 4.7.3. Perform charging system output tests to identify causes of undercharge, no charge, and overcharge conditions.
- 4.7.4. Inspect and adjust or replace alternator drive belts, pulleys, and tensioners and check pulley and belt alignment.
- 4.7.5. Remove, inspect, and install alternator and starter.
- 4.7.6. Identify the high voltage circuit of electric or hybrid electric vehicles and related safety precautions.

WEEK 8-9

Outcome 4.8. Lighting and Accessories: Identify, inspect, and replace electrical and electronic components of lighting systems and accessories.

***Strategies for Teaching and Learning**

Today's class, power point, notes, videos and discussion

***Key Assessments for Student Learning**

Quizzes, Tests, and Hands on Assessments

Competencies

- 4.8.1. Identify the cause of brighter than normal, intermittent, dim, or no light operation.
- 4.8.2. Inspect, replace, and aim headlights and bulbs.
- 4.8.3. Inspect and inspect incorrect turn signal or hazard light operation.
- 4.8.4. Identify and inspect brake light circuit switches, wiring, and connectors.
- 4.8.5. Identify system voltage and safety precautions associated with high-intensity discharge headlights.
- 4.8.6. Inspect and test gauges and gauge sending units for causes of abnormal gauge readings.
- 4.8.7. Identify incorrect horn operation.
- 4.8.8. Identify incorrect wiper and washer operation and replace.
- 4.8.9. Identify incorrect operation of motor-driven accessories.
- 4.8.10. Identify incorrect heated glass, mirror, or seat operation and repair.
- 4.8.11. Identify incorrect electric lock operation and repair.
- 4.8.12. Identify airbag system (SRS) concerns.
- 4.8.13. Identify safety concerns for disarming and enabling the airbag system for vehicle service.

Senior Spring Semester

Subject Code: 177006

Automotive Engine Performance

Students will research vehicle service histories using model specific service bulletins. Students will test and diagnose for engine performance in fuel, air induction and exhaust systems using advanced testing procedures. Topics include computerized engine controls including retrieving and recording diagnostic trouble codes using On Board Diagnostics (OBD).

Additionally, students will diagnose drivability and emissions problems resulting from malfunctions of interrelated systems.

Outcome 1.1. **REQUIRED Employability Skills:** Develop career awareness and employability skills (e.g., face-to-face, online) needed for gaining and maintaining employment in diverse business settings.

Competencies

- 1.1.1. Identify the knowledge, skills, and abilities necessary to succeed in careers.
- 1.1.2. Identify the scope of career opportunities and the requirements for education, training, certification, licensure, and experience.
- 1.1.3. Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options.
- 1.1.4. Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop and maintain professional relationships.

Outcome 1.3.

REQUIRED Business Ethics and Law: Analyze how professional, ethical, and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

Competencies

- 1.3.1. Analyze how regulatory compliance affects business operations and organizational performance.
- 1.3.2. Follow protocols and practices necessary to maintain a clean, safe, and healthy work environment.
- 1.3.3. Use ethical character traits consistent with workplace standards (e.g., honesty, personal integrity, compassion, justice).
- 1.3.4. Identify how federal and state consumer protection laws affect products and services.
- 1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], U.S. Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.
- 1.3.6. Identify deceptive practices (e.g., bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.
- 1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission).
- 1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational, and professional ethical standards.

Outcome 1.4.

REQUIRED Knowledge Management and Information Technology: Demonstrate current and emerging strategies and technologies used to collect, analyze, record, and share information in business operations.

Competencies

- 1.4.1. Use office equipment to communicate (e.g., phone, radio equipment, fax machine, scanner, public address systems).
- 1.4.2. Select and use software applications to locate, record, analyze, and present information (e.g., word processing, electronic mail, spreadsheet, databases, presentation, Internet search engines).
- 1.4.3. Verify compliance with security rules, regulations, and codes (e.g., property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to industry pathway.
- 1.4.4. Use system hardware to support software applications.

- 1.4.5. Use information technology tools to maintain, secure, and monitor business records.
- 1.4.6. Use electronic database to access and create business and technical information.
- 1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g., lists, calendars, address books).
- 1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

Outcome 1.5. **REQUIRED Global Environment:** Evaluate how beliefs, values, attitudes, and behaviors influence organizational strategies and goals.

Competencies

- 1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.
- 1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.
- 1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.
- 1.5.7. Use intercultural communication skills to exchange ideas and create meaning.

Outcome 1.6. **REQUIRED Business Literacy:** Develop foundational skills and knowledge in entrepreneurship, financial literacy, and business operations.

Competencies

- 1.6.1. Identify business opportunities.
- 1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments, and interdepartmental interactions.
- 1.6.8. Identify the features and benefits that make an organization’s product or service competitive.
- 1.6.9. Explain how the performance of an employee, a department, and an organization is assessed.
- 1.6.12. Describe classifications of employee benefits, rights, deductions, and compensations.

Outcome 1.8. **OPTIONAL Operations Management:** Plan, organize, and monitor an organization or department to maximize contribution to organizational goals and objectives.

Competencies

- 1.8.8. Identify routine activities for maintaining business facilities and equipment.
- 1.8.10. Analyze how business management and environmental management systems (e.g., health, safety) contribute to continuous improvement and sustainability.

Outcome 1.10. **OPTIONAL Sales and Marketing:** Manage pricing, place, promotion, packaging, positioning, and public relations to improve quality customer service.

Competencies

- 1.10.2. Determine the customer's needs and identify solutions.
- 1.10.3. Communicate features, benefits, and warranties of a product or service to the customer.
- 1.10.4. Identify the company policies and procedures for initiating product and service improvements.
- 1.10.10. Demonstrate sales techniques.

Outcome 2.1. **Facility Safety:** Handle materials, prevent accidents, and mitigate hazards.

Competencies

- 2.1.1. Use Occupational Safety and Health Administration (OSHA)-defined procedures for identifying employer and employee responsibilities, situations that require working in confined spaces, and safety labeling.
- 2.1.2. Identify and communicate hazards associated with slippery surfaces and lighting.
- 2.1.6. Identify and eliminate workplace clutter and maintain clearance and boundaries.
- 2.1.9. Identify the locations of emergency flush showers, eyewash fountains, Material Safety Data Sheets (MSDSs), fire alarms, and exits.
- 2.1.11. Select and operate fire extinguishers based on the class of fire.
- 2.1.12. Conduct safety inspection of workspace.
- 2.1.13. Identify the types of ergonomic workflow and the need for them.
- 2.1.14. Inspect air and exhaust systems, intake filters, fans, and other mechanical components.

Outcome 2.2. **Personal Safety: Practice personal safety.**

Competencies

- 2.2.1. Interpret personal safety rights according to the employee Right to Know plan.
- 2.2.2. Describe the risk factors associated with working under the influence of drugs and alcohol and how it increases the risk of accident, lowers productivity, raises insurance costs, and reduces profits.
- 2.2.3. Select, use, maintain, and dispose of Personal Protective Equipment (PPE) appropriate to job tasks, conditions, and materials.

Outcome 2.3. **Tool and Equipment Preventive Maintenance:** Identify, use, clean, maintain, and perform planned preventive maintenance on tools and equipment.

Competencies

- 2.3.8. Identify the requirements for calibrating metering, monitoring, and sensing equipment.

Outcome 2.4. General Maintenance: Provide general maintenance to mechanical systems.

Competencies

- 2.4.6. Replace fuel filters.
- 2.4.8. Inspect, service, or replace air filters, filter housings, and intake ductwork.

Outcome 3.2. Computerized Engine Controls: Perform diagnosis and repair of computerized engine controls.

Competencies

- 3.2.1. Retrieve and record stored on-board diagnostics (OBD) trouble codes and clear codes where applicable.
- 3.2.2. Follow published diagnostic procedures and steps to identify the causes of emissions or drivability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes.
- 3.2.3. Check for module communication errors (e.g., controller area network [CAN], BUS systems).
- 3.2.4. Inspect and test computerized engine control system sensors, powertrain control modules (PCMs), actuators, and circuits.
- 3.2.5. Diagnose drivability and emissions problems resulting from malfunctions of interrelated systems (e.g., cruise control, security alarms, suspension controls, traction controls, air conditioning, automatic transmissions, non-original equipment manufacturer [OEM]-installed accessories).

Outcome 3.3. Ignition System: Perform ignition system diagnosis and repair.

Competencies

- 3.3.1. Explain basic ignition system theory.
- 3.3.2. Diagnose and repair ignition system problems (i.e., no starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, power loss, emissions concerns) on vehicles with electronic and distributor ignition systems.
- 3.3.3. Identify cause of cranks but fails to start, hard starting, and starts but does not continue to run problems.
- 3.3.4. Identify causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems.
- 3.3.5. Inspect and test ignition primary and secondary circuit wiring and solid state components.
- 3.3.6. Check and adjust ignition system timing and timing advance and retard.
- 3.3.7. Inspect and test ignition system pickup sensor or triggering devices.

Outcome 3.4.

Fuel, Air induction, and Exhaust System: Perform fuel, air induction, and exhaust system diagnosis and repair.

Competencies

- 3.4.1. Explain principles of exhaust, intake, and turbocharger design and operations.
- 3.4.2. Identify conditions of hot or cold no starting, hard starting, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems.
- 3.4.3. Check fuel for contaminants and quality.
- 3.4.4. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume.
- 3.4.5. Inspect and test cold enrichment system and components.
- 3.4.6. Inspect throttle body, air induction system, intake manifold, and gaskets for vacuum leaks and/or unmetered air.
- 3.4.7. Inspect and service governor systems.
- 3.4.8. Explain fuel injection theory.
- 3.4.9. Inspect and test fuel injectors.
- 3.4.10. Inspect the integrity of the exhaust manifold, exhaust pipes, mufflers, catalytic converters, resonators, tail pipes, and heat shields.
- 3.4.11. Perform exhaust system backpressure test.
- 3.4.12. Evaluate and repair exhaust gas recirculation and exhaust gas treatment systems.
- 3.4.13. Identify positive crankcase ventilation systems.
- 3.4.14. Identify the parts and functions of evaporative emissions controls systems.
- 3.4.15. Check and refill diesel exhaust fluid (DEF) and service diesel particulate filter (DPF).

STUDENT ASSESSMENT POLICY

Automotive Technology

MEDINA COUNTY CAREER CENTER

The student shall perform competencies and competency builders in a manner acceptable to the business community. The standards set for these competencies are recommended by the advisory committee members and employers in the business community and evaluated by the teacher following these guidelines. Competencies will be identified which must be mastered in order to receive credit for the course.

In order to measure the progress of each student in the program and to measure the effectiveness of the total program, the following evaluation procedures will be used:

- Pre-tests
- Post-tests
- Teacher observation and evaluation
- Self-evaluation
- Class discussions
- Skill tests/ timings
- Project development
- Oral tests
- Work/field experiences, business partnership evaluations
- Daily grades
- Lab performance
- Training plan
- Board adopted rules and regulations for co-op training
- ASE Test

Measurement of learning will be an ongoing activity, with emphasis on laboratory activities and competency improvement. Evaluation will be accomplished through pre-assessment of student skills, frequent formative assessment, both visual and written, and summative evaluations to determine mastery of competencies. The number of competencies mastered will be translated into appropriate grades consistent with the school's grading system and consistent with district and school policy.

100	-	91	A
90	-	81	B
80	-	71	C
70	-	61	D
60 and below			F

At the successful completion of the program, each student will receive a Career Passport indicating competencies in which the student is proficient.

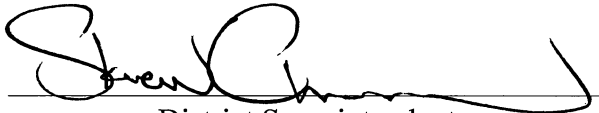
RESOLUTION
Automotive Technology
MEDINA COUNTY CAREER CENTER

WHEREAS, the Automotive Technology Advisory Committee of the Medina County Career Center has reviewed the Automotive Technology Course of Study, and WHEREAS, this Course of Study is based upon the Ohio Department of Education's Career Field Technical Competency Standards for Automotive Technology programs, and

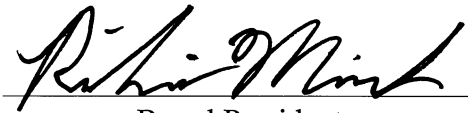
WHEREAS, the Automotive Technology Advisory Committee has reviewed and modified these competencies and added competencies to address local labor market needs, and to acknowledge the school district's ability to offer specialized programs.

NOW, THEREFORE, BE IT RESOLVED, in accordance with the superintendent's recommendation, that the Medina County Career Center adopt the Automotive Technology Course of Study.

Approval Date: 3-21-17



District Superintendent
Steven H. Chrisman



Board President
Richie Muniak

**RECOMMENDATION OF PROGRAM BY
ADVISORY COMMITTEE
Automotive Technology**

MEDINA COUNTY CAREER CENTER

The Career Technical Advisory Committee of the Automotive Technology program, Medina County Career Center, has reviewed this course of study and recommends it for use as the foundation for instruction in classroom, laboratory, and cooperative occupational experiences.

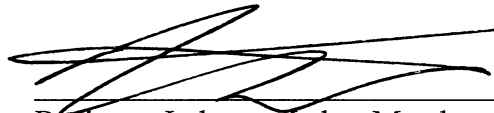
The developers of the course of study have considered local labor market needs and the school district's ability to offer specialized programs. The competencies for this program have been reviewed and modified as being congruent with our school district's philosophy and student outcome measures. Additional competencies that relate to the Automotive Technology field have been incorporated into the course of study.

We believe that this course of study adequately and correctly focuses upon the development of technical competencies, attitudes, values and appreciations critical to successful employment in the Automotive Technology field.

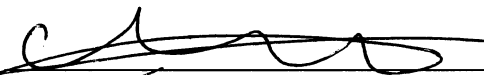
The Automotive Technology Advisory Committee approved the course of study on

1-31-17
Date

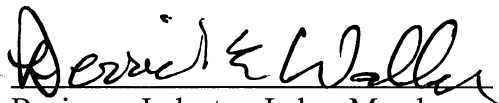
Committee Chairperson




Business, Industry, Labor Member



Business, Industry, Labor Member



Business, Industry, Labor Member



Business, Industry, Labor Member

Business, Industry, Labor Member



Business, Industry, Labor Member

Business, Industry, Labor Member