



**BETHLEHEM AREA VOCATIONAL-TECHNICAL
SCHOOL**
3300 CHESTER AVENUE BETHLEHEM PA 18020

Automotive Technology
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Automotive Technology

Course Description:

Course Description: The Automotive Technology program at BAVTS is an instructional program that prepares individuals to apply technical knowledge and skills to engage in the servicing and maintenance of all types of automobiles and light trucks. This program includes instruction in: Brake Systems, Steering and Suspension Systems, Manual Drive Train and Axles, Engine Repair, Electrical and Electronics, and Engine Performance. Instruction is also given in the adjustment and repair of individual components and systems such as cooling systems, fuel system components and air conditioning and includes the use of technical repair information and the state inspection procedures. The Automotive Technology program at BAVTS is based on NATEF/ ASE curriculum and is designed to prepare you for entry into the Automotive Service field. You will participate in systems theory lessons, integrated with productive hands on training. You will also learn applied physics, applied mathematics, and the use of literacy and communication skills in the workplace.

Average pay: According to Payscale.com, the average annual salary for an automotive service technician in our area is \$23,000-\$63,000.

Two-Year Degree: Associate's degree in Automotive Technology & manufacture specific training

In demand careers: Automotive Service Technician, Automotive Repair Technician, Light/Medium Duty Repair Technician, Heavy Truck/Equipment Repair Technician, Service Advisor, and Parts Personnel/Manager

Certifications: Students in the program have the opportunity to acquire the following certifications.

- PA State Safety Inspector Certification.
- PA State Emissions Inspector Certification.
- EPA 609 Mobile Vehicle Air Conditioning Certification.
- S/P2 Mechanical Safety Certification.
- S/P2 Mechanical Pollution Prevention Certification.
- Automotive Lift Institute- Lifting it Right Certification
- NC3 Digital Multimeter Certification
- Valvoline Engine Oil Certification

Reference Material:

All Data Pro
Shop Key Pro
IdentiFix
Manufacture Specific Diagnostic Software

Classroom Tools:

Chromebook (laptops)
CDX (online resource)
All Data Pro (online resource)
Shop Key Pro (online resource)
IdentiFix (online resource)
Microsoft Word & Excel
All Basic & Advanced Automotive Repair Tools

- Automotive Lifts & Alignment Racks
- Diagnostic & Electronic Tools
- All Automotive Hand Tools
- All Automotive Specialty Tools

Course Syllabus Level 1

MP1

Rotation Period:

Projects:

Basic Automotive Shop Safety
Dismount, Mount, Balance Wheels & Tires
Vehicle Lift Safety & Guided Practice
Battery Starting & Charging – Jump Starting
Remove Braking Components, inspect & repair
Disassemble, Inspect & Re-assemble Engine
Perform Engine Oil Service

Duty and Tasks Covered:

Rotations:

- 201 Identify and follow all safety rules.
- 202 Demonstrate the ability to secure vehicles on jack stands and hydraulic lifts.
- 205 Identify and demonstrate the safe use of hand tools.
- 541 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
- 542 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
- 721 Start a vehicle using jumper cables or an auxiliary power supply.
- 624 Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks.
- 846 Perform engine oil and filter change.

Rotation Outcomes: Students can make an informed decision about the Automotive Technology career choice.

MP2: Automotive Fundamentals

MP3: Steering Suspension & Braking Systems

MP4: Steering Suspension & Braking Systems

Classroom Assignments:

BAVTS CDX online training course

SP/2 Mechanical Safety & Mechanical Pollution Prevention Certifications.

Duty and Tasks Covered Level I:

ORIENTATION

- 101 Explain and follow all lab rules.
- 102 Participate in basic shop management.
- 103 Participate in parts ordering.
- 104 Demonstrate auto shop safety and hygiene.
- 105 Demonstrate the use of service information.
- 106 Demonstrate proper telephone courtesy.
- 107 Identify vehicle by: sight, V.I.N. and/or ID tag.
- 108 Identify career paths within the career and technical education program.
- 109 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
- 110 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 111 Locate and interpret vehicle and major component identification numbers.

SAFETY

- 201 Identify and follow all safety rules.
- 202 Demonstrate the ability to secure vehicles on jack stands and hydraulic lifts.
- 203 Demonstrate the ability to safely set-up/shut-down oxygen acetylene welding equipment.
- 204 Identify chemical safety, "Right-To-Know Laws" and Safety Data Sheets (SDS).
- 205 Identify and demonstrate the safe use of hand tools.
- 206 Identify and demonstrate the safe use of power tools.
- 207 Identify and demonstrate the safe use of protective clothing and equipment.
- 208 Identify and demonstrate the safe use of fire protection equipment.
- 209 Identify and demonstrate the safe use of shop equipment.
- 210 Explain EPA and OSHA Regulations.

TOOLS/FASTENERS

- 301 Identify and use fasteners and bolts.
- 302 Demonstrate the ability to correctly drill and use re-threading tools.
- 303 Demonstrate the ability to correctly read and interpret precision automotive measuring tools.
- 304 Demonstrate the ability to correctly use automotive tools.
- 305 Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.

SUSPENSION AND STEERING

- 502 Identify and interpret suspension and steering system concerns; determine necessary action.
- 507 Inspect rack and pinion steering gear; inspect mounting bushings and brackets.
- 508 Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
- 509 Determine proper power steering fluid type; inspect fluid level and condition.
- 510 Flush, fill, and bleed power steering system.
- 511 Diagnose power steering fluid leakage; determine necessary action.
- 513 Remove and reinstall power steering pump.
- 514 Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.
- 515 Inspect and replace power steering hoses and fittings.
- 516 Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
- 517 Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
- 519 Inspect, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.
- 520 Inspect, and/or replace strut rods and bushings.
- 521 Inspect, and/or replace upper and/or lower ball joints.
- 522 Inspect, and/or replace steering knuckle assemblies.
- 523 Inspect, and/or replace short and long arm suspension system coil springs and spring insulators.
- 524 Inspect, and/or replace, and adjust suspension system torsion bars; inspect mounts.
- 525 Inspect, and/or replace stabilizer bar bushings, brackets, and links.
- 526 Inspect, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.
- 527 Inspect, remove, and replace shock absorbers.
- 529 Lubricate suspension and steering systems.
- 530 Perform pre-alignment inspection and measure vehicle ride height; perform necessary action.

- 531 Prepare vehicle for wheel alignment on the alignment machine; describe alignment angles and perform four wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel.
- 535 Check front and/or rear cradle (subframe) alignment; determine necessary action.
- 536 Inspect tire condition; identify tire wear patterns; check and adjust air pressure; determine necessary action.
- 537 Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
- 538 Rotate tires according to manufacturer's recommendations.
- 539 Measure wheel, tire, axle flange, and hub runout; determine necessary action.
- 540 Diagnose tire pull problems; determine necessary action.
- 541 Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
- 542 Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
- 544 Inspect tire and wheel assembly for air loss; perform necessary action.
- 545 Repair tire using internal patch.
- 546 Identify indirect and direct tire pressure monitoring systems (TPMS) calibrate system; verify operation of instrument panel lamps.
- 547 Identify steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure.

BRAKES

- 602 Identify and interpret brake system concern; determine necessary action.
- 605 Measure brake pedal height, travel, and free play (as applicable); determine necessary action.
- 606 Check master cylinder for internal/external leaks and proper operation; determine necessary action.
- 607 Remove, bench bleed, and reinstall master cylinder.
- 608 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action.
- 609 Replace brake lines, hoses, fittings, and supports.
- 610 Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).
- 611 Select, handle, store, and fill brake fluids to proper level.
- 612 Inspect, test, and/or replace components of brake warning light system.
- 613 Bleed and/or flush brake system.
- 614 Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
- 615 Remove, clean, inspect, and measure brake drums; determine necessary action.
- 616 Refinish brake drum; measure final drum diameter.

- 617 Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
- 618 Inspect and install wheel cylinders.
- 619 Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings.
- 620 Install wheel, torque lug nuts, and make final checks and adjustments.
- 622 Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action.
- 623 Clean and inspect caliper mounting and slides/pins for operation, wear, and damage; determine necessary action.
- 624 Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks.
- 625 Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action.
- 626 Remove and reinstall rotor.
- 627 Refinish rotor on vehicle; measure final rotor thickness.
- 628 Refinish rotor off vehicle; measure final rotor thickness.
- 630 Check brake pad wear indicator system operation; determine necessary action.
- 632 Check vacuum supply to vacuum-type power booster and check power assist operation.
- 633 Remove, clean, inspect, repack, and install wheel bearings, RACES and replace seals; install hub and adjust bearings.
- 634 Check parking brake cables and components including integral parking brake system for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.
- 635 Check parking brake and indicator light system operation; determine necessary action.
- 636 Check operation of brake stop light system; determine necessary action.
- 638 Inspect and replace wheel studs.
- 639 Remove and reinstall sealed wheel bearing assembly.
- 640 Identify and inspect electronic brake control system components; determine necessary action.
- 641 Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action.
- 643 Bleed the electronic brake control system hydraulic circuits.
- 644 Identify traction control/vehicle stability control system components.
- 645 Describe the operation of a regenerative braking system.

Level I Outcomes: Students have developed core skills within the automotive industry. Students can continue to the level II portion of the program applying previously learned skills.

Course Syllabus Level 2:

(With Mr. Nonnemacher)

MP1: Engine Components ID and Operation

MP2: Engine Disassembly and precision measuring, reassembly

MP3: Drivetrain, Axles, wheel bearings, CV Joints

MP4: Automatic & Manual Transmissions

Classroom Assignments:

BAVTS CDX online training course

SP/2 Mechanical Safety & Mechanical Pollution Prevention Certifications.

Duty and Tasks Covered

Engine Repair:

802 Identify and interpret engine performance concern; determine necessary action.

805 Identify components and inspect engine assembly for fuel, oil, coolant, and other leaks, determine necessary action.

806 Diagnose abnormal engine noise or vibration concerns; determine necessary action.

807 Diagnose abnormal exhaust color, odor, and sound; determine necessary action.

808 Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.

809 Perform cylinder power balance test; determine necessary action.

810 Perform cylinder cranking and running compression tests; determine necessary action.

811 Perform cylinder leakage test; determine necessary action.

902 Verify operation of the instrument panel engine warning indicators.

903 Install engine covers using gaskets, seals, and sealers as required.

905 Adjust valves (mechanical or hydraulic lifters).

906 Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.

907 Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.

1002 Check fluid level and fluid condition in a transmission or a transaxle equipped with a dip-stick.

1003 Check fluid level and fluid condition in a transmission or a transaxle not equipped with a dip-stick.

1004 Drain and replace fluid and filter(s).

1005 Identify drivetrain components and configuration.

1006 Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral switch.

1007 Inspect for leakage at external seals, gaskets and bushings.

Level II Outcomes: Students have developed a strong understanding of electrical components within the modern day vehicle as well as additional powertrain service procedures.

Course Syllabus Level 3

(With Mr. Cantrel)

Marking Periods 1 and 2: Electrical and electronics

Classroom Assignments:

BAVTS CDX online training course

SP/2 Mechanical Safety & Mechanical Pollution Prevention Certifications.

Duty and Tasks Covered:

700: ELECTRICAL/ELECTRONIC SYSTEMS

702- Identify and interpret electrical/electronic system concern; determine necessary action.

705- Use wiring diagrams during diagnosis of electrical circuit problems.

706- Check electrical circuits with a test light; determine necessary action.

707- Check electrical circuits using fused jumper wires; determine necessary action.

708- Locate shorts grounds opens and resistance problems in electrical/electronic circuits; determine necessary action.

709- Measure and diagnose the cause(s) of excessive parasitic draw; determine necessary action.

710- Inspect and test fusible links circuit breakers and fuses; determine necessary action.

711- Inspect and test switches connectors relays solenoid solid state devices and wires of electrical/electronic circuits; perform necessary action.

712- Remove and replace terminal end from connector; replace connectors and terminal ends.

713- Repair wiring harness and/or solder (including CAN/BUS systems) solder repair.

715- Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.

716- Perform battery state-of-charge test; determine necessary action.

717- Perform battery capacity test; confirm proper battery capacity for vehicle application; determine necessary action.

718- Maintain or restore electronic memory functions.

719- Inspect clean fill and/or replace battery cables connectors clamps and hold-downs.

720- Perform battery charge.

723- Perform starter current draw tests; determine necessary action.

724- Perform starter circuit voltage drop tests; determine necessary action.

725- Inspect and test starter relays and solenoids; determine necessary action.

726- Remove and install starter in a vehicle.

727- Inspect and test switches connectors and wires of starter control circuits; perform necessary action.

728- Differentiate between electrical and engine mechanical problems that cause a slow-crank or no-crank condition.

729- Perform charging system output test; determine necessary action.

730- Diagnose charging system for the cause of undercharge no-charge and overcharge conditions.

732- Remove inspect and install generator (alternator).

735- Inspect replace and aim headlights and bulbs.

739- Diagnose the cause of incorrect operation of warning devices and other driver information systems; determine necessary action.

740- Diagnose incorrect horn operation; perform necessary action.

741- Diagnose incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.

742- Diagnose incorrect washer operation; perform necessary action.

743- Diagnose incorrect operation of motor-driven accessory circuits; determine necessary action.

746- Remove and reinstall door panel.

747- Use a digital multimeter (DMM)

748- Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.

749- Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.

750- Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights and driving lights) replace as needed.

751- Identify system voltage and safety precautions associated with high-intensity discharge headlights.

752- Describe the operation of keyless entry and remote-start systems.

753- Demonstrate knowledge of electrical and electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).

Marking Periods 3 and 4: Engine Performance

Classroom Assignments:

BAVTS CDX online training course

Duty and Tasks Covered:

800 ENGINE PERFORMANCE

- 802 Identify and interpret engine performance concern; determine necessary action.
- 805 Identify components and inspect engine assembly for fuel, oil, coolant, and other leaks, determine necessary action.
- 806 Diagnose abnormal engine noise or vibration concerns; determine necessary action.
- 807 Diagnose abnormal exhaust color, odor, and sound; determine necessary action.
- 808 Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
- 809 Perform cylinder power balance test; determine necessary action.
- 810 Perform cylinder cranking and running compression tests; determine necessary action.
- 811 Perform cylinder leakage test; determine necessary action.
- 812 Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.
- 813 Verify engine operating temperature; determine necessary action.
- 814 Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.
- 816 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
- 817 Diagnose the causes of emissions or drivability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data.
- 818 Access and use service information to perform step-by-step diagnosis.
- 819 Perform active tests of actuators using a scan tool; determine necessary action.
- 820 Describe the importance of running all OBDII monitors for repair verification.
- 822 Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.
- 823 Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.
- 824 Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary.
- 825 Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action.
- 826 Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.
- 827 Replace fuel filters.

- 828 Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.
- 829 Inspect and test fuel injectors.
- 830 Verify idle control operation.
- 831 Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.
- 833 Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.
- 835 Inspect, test, service and replace components of the EGR system, including electrical/electronic sensors, controls, and wiring, EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action.
- 837 Inspect and test mechanical components of secondary air injection systems; perform necessary action.
- 838 Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.
- 839 Inspect and test catalytic converter efficiency.
- 841 Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.
- 842 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.
- 843 Remove and replace timing belt; verify correct camshaft timing.
- 844 Remove and replace thermostat and gasket/seal.
- 845 Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.
- 846 Perform engine oil and filter change.

Level III Outcomes: Students have developed a strong understanding of Heating Ventilation and Air Conditioning operation, service and repair. Students reviewed electrical fundamentals and learned advanced electrical diagnostic strategies. Students learned base engine diagnostics as well as basic and advanced engine performance systems operation, diagnosis and repairs.

Supplemental Learning Activities

Students who participate in this program will also have opportunities to participate in the following program and school-sponsored activities:

SkillsUSA: Two groups of two students will have the opportunity to participate in the Automotive Service Specialization & Automotive Technology competitions.

Greater Lehigh Valley Auto Dealers Association (GLVADA): A team of two students will have the opportunity to participate in a local competition that has the potential to escalate to the national level. GLVADA is both a knowledge and skill-based competition that formatted to repair a “bugged” vehicle within an allotted period of time. Competitors are judged on behalf of proper repair procedure and quality of work.

UTI High school Top Tech Challenge: Top Tech Challenge allow student teams (two competitors per team) to test the knowledge and skills they have learned in school and to see first-hand how STEM principles are used in productive careers. Students are able to gain scholarship opportunities via Top Tech Challenge.

NTHS: Students who have received an “A” in their career and technical program as well as a “B” average at their sending school are eligible to become a member of the BAVTS Chapter of the National Technical Honor Society.

Cooperative Education: Students who have attended six quarters in their career and technical program are eligible to participate in a paid working experience during the PM session of BAVTS. Positions must be available and the students must be recommended by the CTE teacher to be eligible.

Job Shadowing: Students are eligible to visit business and industry partners for one or more days to view the day-to-day operations of this career area.

Internships: Students who have completed six or more quarters of their CTE program are eligible to work for a business and industry partner with the recommendation of the instructor and the availability of assignment.

Field Trips: Students in this program will on occasion attend field trips that expose them to educational experiences within the career field.

