UNOH UNIVERSITY OF NORTHWESTERN OHIO

Articulation Agreement

Between

College of Applied Technologies

and

Institution: Tri Star Career Compact

Tech Prep Automotive Technology

The University of Northwestern Ohio believes that the area Tech Prep automotive technology programs have extensive course work in technical areas that gives students a solid foundation for college study.

To articulate credit with the University in this agreement, the articulating automotive programs must currently be NATEF Master, or AST accredited and maintain said accreditation or meet the attached UNOH learning outcomes.

The University will grant advanced placement to graduates who meet the following requirements:

- Student will have a minimum grade of "B" (3.0) in the high school automotive or diesel program courses, each year.
- Student will have a 2.5 grade point average in junior and senior year academic courses.
- Completion of two years in a NATEF accredited Tech Prep automotive or diesel program. The institution must be NATEF accredited in Engine Diagnosis and Repair, Suspension and Steering, and Hydraulic Brakes. Institutions that are not NATEF accredited in these areas will have the opportunity to articulate with UNOH if the attached lists of learning outcomes are met.

To take advantage of this agreement, the student must:

- Contact the Admission Office at the University of Northwestern Ohio for a formal admissions application to the university (419)998-3120.
- Pick up the Articulation Application from the University Admissions Department. You can also call the University to have the application form mailed or e-mailed to you at (419) 998-3120.
- Take the form to the high school where the form should be completed and approved by the student's instructor and counselor.

- After it is approved by the student's instructor and counselor, the school's chief administrator should sign the form and mail it to the Registrar's Office at the University.

- After review of the materials by the University personnel, the student will be notified if advanced credit has been awarded. Awarded credit will be reflected on the students' transcript after completion of the first term.

COURSES AND CREDITS FOR ADVANCED PLACEMENT

CATALOG DESCRIPTIONS

AU122 AUTOMOTIVE ENGINE DIAGNOSIS AND REPAIR (6 credits)
The principles of four-stroke engine designs are the foundation for this study. This introduction to automotive engines includes theory, construction and overhaul procedures, including cylinder heads, blocks, bearings, pistons, rods, crankshafts, valve train and gaskets. Proper use of hand tools, precision tools, special engine tools and equipment is demonstrated. Lab work includes application of diagnosis, overhaul and repair procedures on training aids.

AU126 SUSPENSION AND STEERING (6 credits)
The fundamentals of the chassis, including basic and power steering systems, variable effort power steering systems, suspension systems both basic and computer controlled, geometric centerline alignment, thrust line alignment and total four-wheel alignment provide the focus of this course. Proper procedures in diagnosis of steering and suspension systems for replacing components along with basic frame and body measuring for correct locations are covered. Also covered is the diagnosis of vehicle vibrations and tire pressure monitor systems. Lab work includes steering and suspension repair, tire balancing and alignment on computerized alignment equipment, and computerized wheel balancing, utilizing training aids and live vehicles.

AU127 HYDRAULIC BRAKE SYSTEMS (6 credits)
The fundamental principles of hydraulics pertaining to the automotive and medium duty truck brake systems are presented. Students will study the theory of operation and advanced study of component principles. Students will use standard skills to diagnose and repair hydraulic systems, drum and disc brake systems, power assist units and anti-lock brake systems. Lab work includes demonstration, on-car practice to provide a working knowledge of diagnosis and repair of the hydraulic systems, drum and disc brake systems, power assist units and associated systems. Included will be coverage of wheel bearings, parking brakes and related electrical circuits and use of on-car brake lathes.

NATEF Maintenance & Light Repair and non-NATEF programs, initial the learning outcomes your program meets:

✓ AU122 Automotive Engine Diagnosis and Repair

✓ AU126 Suspension and Steering

✓ AU127 Hydraulic Brakes Systems

We, the undersigned representatives of the cooperating University and high school/career centers, agree that a student completing vocational training in a Tech Prep vocational program may be eligible for advanced placement credit. Guidelines for acceptance of the credit are covered in this document.

University of Northwestern Ohio	[illegible]
Institution	**Institution**
	[illegible]
Vice President for Academic Affairs Provost	**Director**
	1/10/19
Date	**Date**

Agreement will be reevaluated in five years.

Return agreement to:

The University of Northwestern Ohio
Attention: Shawnna Roob, Educational Relations Representative
1441 N. Cable Rd.
Lima, OH 45805

UNOH UNIVERSITY OF NORTHWESTERN OHIO

UNOH Learning Outcomes AU-122, Engine Diagnosis and Repair

Students are required to meet the following requirements to receive articulation for AU-122, Automotive Engine Diagnosis and Repair at the University of Northwestern Ohio.

General: Engine Diagnosis; Removal and Reinstallation (R & R)

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

2. Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins.

3. Verify operation of the instrument panel engine warning indicators.

4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.

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

6. Remove and replace timing belt; verify correct camshaft timing.

7. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.

8. Inspect engine mounts and determine necessary action.

9. Remove and reinstall engine in an OBDII or newer vehicle; reconnect all attaching components and restore the vehicle to running condition

Cylinder Head and Valve Train Diagnosis and Repair

1. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures.

2. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.

3. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action.

4. Adjust valves (mechanical or hydraulic lifters).

5. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.

6. Establish camshaft position sensor indexing.

7. Inspect valve springs for squareness and free height comparison; determine necessary action.

8. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine necessary action.

9. Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action.

10. Inspect valves and valve seats; determine necessary action.

11. Check valve spring assembled height and valve stem height; determine necessary action.

12. Inspect valve lifters; determine necessary action.

13. Inspect and/or measure camshaft for runout, journal wear and lobe wear.

14. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action.

Engine Block Assembly Diagnosis and Repair

1. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer).

2. Disassemble engine block; clean and prepare components for inspection and reassembly.

3. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action.

4. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine necessary action.

5. Deglaze and clean cylinder walls.

6. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.

7. Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine necessary action.

8. Inspect main and connecting rod bearings for damage and wear; determine necessary action.

9. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine necessary action.

10. Inspect and measure piston skirts and ring lands; determine necessary action.

11. Determine piston-to-bore clearance.

12. Inspect, measure, and install piston rings.

13. Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance or silencer); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.

14. Assemble engine block.

Lubrication and Cooling Systems Diagnosis and Repair

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, heater core and galley plugs; determine necessary action.

2. Identify causes of engine overheating.

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

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

5. Inspect, remove, and replace water pump.

6. Remove and replace radiator.
7. Remove, inspect, and replace thermostat and gasket/seal.
8. Inspect and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.
9. Perform oil pressure tests; determine necessary action.
10. Perform engine oil and filter change.
11. Inspect auxiliary coolers; determine necessary action.
12. Inspect, test, and replace oil temperature and pressure switches and sensors.
13. Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action.

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UNOH Learning Outcomes AU-126

Learning outcomes do not apply to NATEF AST or Master accredited schools.

Students are required to meet the following learning outcomes to receive articulation credit for AU-126, Steering and Suspension at the University of Northwestern Ohio.

General: Suspension and Steering Systems

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
2. Identify and interpret suspension and steering system concerns; determine necessary action.

Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS).
2. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.
3. Determine proper power steering fluid type; inspect fluid level and condition.
4. Flush, fill, and bleed power steering system.
5. Inspect for power steering fluid leakage; determine necessary action.
6. Remove, inspect, replace, and adjust power steering pump drive belt.
7. Inspect and replace power steering hoses and fittings.
8. Inspect and replace pitman arm, relay (center link/intermediate) rod, idler arm and mountings, and steering linkage damper.
9. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
10. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
11. Inspect electric power-assisted steering.

Suspension Systems Diagnosis and Repair

1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action.

2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.

3. Inspect, remove and install upper and lower control arms, bushings, shafts, and rebound bumpers.

4. Inspect, remove and install strut rods and bushings.

5. Inspect, remove and install upper and/or lower ball joints (with or without wear indicators).

6. Inspect, remove and install torsion bars and mounts

7. Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links.

8. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.

9. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings.

10. Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts.

Related Suspension and Steering Service

1. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.

2. Describe the function of the power steering pressure switch.

Wheel Alignment Diagnosis, Adjustment, and Repair

1. Perform pre-alignment inspection and measure vehicle ride height; perform necessary action.

2. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel.

3. Check toe-out-on-turns (turning radius); determine necessary action.

4. Check SAI (steering axis inclination) and included angle; determine necessary action.

5. Check rear wheel thrust angle; determine necessary action.

6. Check for front wheel setback; determine necessary action.

Wheels and Tires Diagnosis and Repair

1. Inspect tire condition; identify tire wear patterns; check for correct tire size and application (load and speed ratings) and adjust air pressure; determine necessary action.

2. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.

3. Rotate tires according to manufacturer's recommendations.

4. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).

5. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.

6. Inspect tire and wheel assembly for air loss; perform necessary action.

7. Repair tire using internal patch.

8. Identify and test tire pressure monitoring system (indirect and direct) for operation; calibrate system; verify operation of instrument panel lamps.

9. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.

UNOH Learning Outcomes AU-127

Learning outcomes do not apply to NATEF AST or Master accredited schools.

Students are required to meet the following learning outcomes to receive articulation credit for AU-127, Hydraulic Brake Systems at the University of Northwestern Ohio.

General: Brake Systems Diagnosis

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

2. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS).

3. Install wheel and torque lug nuts.

Hydraulic System Diagnosis and Repair

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).

2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.

3. Check master cylinder for internal/external leaks and proper operation; determine necessary action.

4. Remove, bench bleed, and reinstall master cylinder.

5. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, and wear; check for loose fittings and supports; determine necessary action.

6. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).

7. Select, handle, store, and fill brake fluids to proper level.

8. Identify components of brake warning light system.

9. Bleed and/or flush brake system.

10. Test brake fluid for contamination.

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Drum Brake Diagnosis and Repair

1. Remove, clean, inspect, and measure brake drum diameter; determine necessary action.
2. Refinish brake drum and measure final drum diameter; compare with specifications.
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.
4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.

Disc Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action.
2. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
3. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.
4. Remove, inspect, and replace pads and retaining hardware; determine necessary action.
5. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
6. Clean and inspect rotor; measure rotor thickness, thickness variation, and lateral run out; determine necessary action.
7. Remove and reinstall rotor.
8. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
9. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
10. Retract and re-adjust caliper piston on an integrated parking brake system.

11. Check brake pad wear indicator; determine necessary action.

12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.

Power-Assist Units Diagnosis and Repair

1. Check brake pedal travel with, and without, engine running to verify proper power booster operation.

2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.

3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action.

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.), Diagnosis and Repair

1. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.

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

3. Check parking brake operation and parking brake indicator light system operation; determine necessary action.

4. Check operation of brake stop light system.

5. Replace wheel bearing and race.

6. Remove and reinstall sealed wheel bearing assembly.

7. Inspect and replace wheel studs.

Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components; determine necessary action.

2. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action.

3. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action.

4. Bleed the electronic brake control system hydraulic circuits.

5. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).

6. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).