Automotive Technology and Automotive Light Duty Diesel Technology Option Mississippi Curriculum Framework

Program CIP: 47.0604 – Automotive/Automotive Mechanics Technology/Technician

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The Office of Curriculum and Instruction (OCI) was founded in 2013 under the Division of Workforce, Career, and Technical Education at the Mississippi Community College Board (MCCB). The office is funded through a partnership with The Mississippi Department of Education (MDE), who serves as Mississippi's fiscal agent for state and federal Career and Technical Education (CTE) Funds. The OCI is tasked with developing statewide CTE curriculum, programming, and professional development designed to meet the local and statewide economic demand.

For information, please contact curriculum@mccb.edu.

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Adoption of National Certification Standards

AUTOMOBILE TECHNICIAN TRAINING ACCREDITATION PROGRAM

The ASE Entry-Level Certification program is specially designed to evaluate and certify students who are near the end of their studies in the areas of Automobile Service, Collision Repair & Refinishing, and M/H Truck. The National Institute for Automotive Service Excellence (ASE) developed the exams in partnership with the ASE Education Foundation and SkillsUSA.

The testing program Certification program is specially designed to evaluate and certify students who are near the end of their studies in the area's increasing demands for measurable outcomes and accountability.

For students, ASE Entry-Level Certification can be thought of as the first step in building a career as a service professional by providing them with their first industry-recognized certification through ASE.

There are no work experience requirements for Entry-Level Certification; the student simply needs to pass one or more of the certification tests. Upon successful completion of a test, the school prints the certificate, has it signed by the school principal or proctor for validation, and then awards it to the student. Entry-Level Certification is valid for two years from the date the test was taken.

All secondary and post-secondary entry-level automotive training programs may use the ASE Entry-Level Certification program, regardless of their accreditation status or involvement with ASE, the ASE Education Foundation, or Skill Susa. The tests are available year-round.

All tests are administered at the school through a secure computer-based testing (CBT) platform delivered via the internet. A proctor, who is a staff person other than an automotive instructor, enables the test for students and monitors their test sessions.

For more information about the program, including testing details, scoring criteria, and more, please visit www.ase.com/Entry-Level

Industry Job Projection Data

A summary of occupational data is available from the Mississippi Department of Employment Security.

https://mdes.ms.gov/information-center/labor-market-information/

Articulation

Check with the local community college CTE administration for articulation agreements.

Industry Credentials, Certifications, and Professional Licensure

See the "Industry Credentials, Certifications, and Professional Licensure"
https://www.mccb.edu/assessment

Dual Enrollment

See the "Procedures Manual For Dual Enrollment and Accelerated Programs"
http://www.mississippi.edu/cjc/dual_enrollment.asp

Program Description

The Automotive Technology and Automotive Light Diesel Technology programs are an instructional program that prepares individuals to engage in the servicing and maintenance of all types of automobiles. Instruction includes the diagnosis of malfunctions of all eight areas of ASE Education Foundation certification (Engine Repair, Electrical and Electronic Systems, Engine Performance, Brakes, Steering and Suspension Systems, Manual Drive Trains and Axles, Automatic Transmissions and Transaxles, Heating and Air Conditioning). Automotive Technology may be taught as either a career certificate program or as a technical program.

The curriculum for Postsecondary Automotive Technology is based upon the task list published in ASE Certification for Automobile Training Programs and the ASE Education Foundation, Inc. (ASE). This task list serves as a national standard for certification of automobile technician training programs and is regularly reviewed and validated by technicians and engineers in the automotive industry. The task list is based upon the following assumptions, which also apply to the model curriculum:

1. In all areas, appropriate theory, safety, and support instruction is required for performing each task. It is assumed that this instruction has included identification and use of appropriate tools and testing and measuring equipment required to accomplish certain tasks. It is also assumed that the student has received necessary training to locate and use current reference and training materials from accepted industry publications (in most cases, published by the vehicle manufacturer), which present manufacturers' recommended or required specifications and procedures for performing various tasks.

2. All diagnostic and repair tasks described in this document are to be accomplished in accordance with manufacturer's recommended procedures and specifications.

3. The individual training program being evaluated for certification should have written and detailed performance standards for each task taught in the curriculum. Learning progress of students should be monitored and evaluated against these performance standards. A system should be in place which informs all students of their individual progress through all phases of the training program.

4. It is recognized that individual courses of study will differ across automobile technician training programs. The development of appropriate learning delivery systems and tests which monitor student progress will be the responsibility of the individual training program.

For additional information on ASE Student Certification, contact the following:

ASE Education Foundation
1503 Edwards Ferry Rd. N.E., Suite 401
Leesburg, VA 20176
(703) 669-6650

For more information related to implementing ASE Student Certification at your local campus, please visit http://www.ASEeducationfoundation.org.

Industry standards are based on the *Standards and Guidelines for Automotive Programs.*

Suggested Course Sequence

Accelerated Transition Pathway

			SCH Breakdown			Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total sch Hours	Certification Name
ATT 1811	Introduction, Safety, and Employability Skills	1	1	0	15	
ATT 1214	Brakes	4	2	4	90	
ATT 2334	Steering and Suspension	4	2	4	90	
	Electives	6				
	TOTAL	**15**			**195**	

Career Certificate Required Courses

Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total sch Hours	Certification Name
ATT 1124	Basic Electrical/Electronic	4	2	4	90	
ATT 1134	Advanced Electrical/Electronic Systems	4	2	4	90	
ATT 1214	Brakes	4	2	4	90	
ATT 1424	Engine Performance I	4	2	4	90	
ATT 1715	Engine Repair	5	2	6	120	
ATT 1811	Introduction, Safety, and Employability skills	1	1	0	15	
ATT 2434	Engine Performance II	4	2	4	90	
	Elective	4				
	TOTAL	**30**	**13**	**26**	**585**	

Technical Certificate Required Courses

			SCH Breakdown				Certification Information		
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total sch Hours	Lecture	Lab	Certification Name
ATT 1313	Manual Drive Trains/Transaxles	3	1	4		75			
ATT 2614 ATT 2334	Heating & Air Conditioning ***OR*** Steering and Suspension	4	2	4		90			
ATT 2324	Automatic Transmissions/Transaxles	4	2	4		90			
	Elective	4							
	Total	**15**				**345**			

Suggested Course Sequence

Career Certificate (Auto Technicians-Light Duty Diesel Option)

			SCH Breakdown			
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Certification Name
ATT 1124	Basic Electrical	4	2	4	90	ASE Electrical/Electronic Systems ASE Brakes ASE Engine Performance ASE Steering/Suspension ASE HVAC
ATT 1134	Advanced Electrical	4	2	4	90	
ATT 1214	Brakes	4	2	4	90	
ATT 1424	Engine Performance I	4	2	4	90	
ATT 1715	Engine Repair	5	2	6	120	
ATT 1811	Introduction, Safety, Employability	1	1	0	15	
ATT 2334	Steering & Suspension	4	2	4	90	
ATT 2614	Heating and Air	4	2	4	90	
	TOTAL	**30**			**675**	

Technical Certificate (Auto Light Diesel Option)

			SCH Breakdown			
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Certification Name
ATT 2112	Introduction to Light Duty Diesel Technology, Tools and Safety	2	1	2	45	ASE Maintenance and Light Repair
ATT 2125	Light Duty Diesel Engine Repair	5	2	6	120	
ATT 2214	Light Duty Diesel Engine Performance	4	2	4	90	
ATT 2224	Light Duty Diesel Electrical	4	2	4	90	
	TOTAL	**15**			**345**	

General Education Core Courses

To receive the Associate of Applied Science degree, a student must complete all of the required coursework found in the Career Certificate option, Technical certificate option, and a minimum of 15 semester hours of General Education core. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester or provided primarily within the last semester. Each community college will specify the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science degree at their college. The Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) Section 9 Standard 3 of the *Principles of Accreditation: Foundations for Quality Enhancement*[2] describes the general education core.

Section 9 Standard 3:

3. The institution requires the successful completion of a general education component at the undergraduate level that

   a) is based on a coherent rationale.

   b) is a substantial component of each undergraduate degree program. For degree completion in associate programs, the component constitutes a minimum of 15 semester hours of the equivalent; for baccalaureate programs, a minimum of 30 semester hours or the equivalent.

   c) ensures breadth of knowledge. These credit hours include at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural science/mathematics. These courses do not narrowly focus on those skills, techniques, and procedures specific to a particular occupation or profession.

General Education Courses

			SCH Breakdown			Contact Hour Breakdown		Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Total Contact Hours	Lecture	Lab	Certification Name
	Humanities/Fine Arts	3						
	Social/Behavioral Sciences	3						
	Math/Science	3						
	Academic electives	6						
	TOTAL	**15**						

[2] Southern Association of Colleges and Schools Commission on Colleges. (2017). *The Principles of Accreditation: Foundations for Quality Enhancement.* Retrieved from http://www.sacscoc.org/2017ProposedPrinc/Proposed%20Principles%20Adopted%20by%20BOT.pdf

Technical Electives

			SCH Breakdown				Certification Information
Course Number	Course Name	Semester Credit Hours	Lecture	Lab	Clinical/ Internship	Total sch Hours	Certification Name
ATT 2444	Engine Performance III	4	2	4		90	
ATT2714	Light Duty Hybrid/ Electric Vehicle Systems	4	2	4		90	
ATT 2334	Steering and Suspension	4	2	4		90	
ATT 2911	Special Problem I in Automotive Tech.	1		2		30	
ATT 2912	Special Problem	2		4		60	
ATT 2913	Special Problem	3		6		90	
ATT 2914	Special Problem	4		8		120	
ATT 2915	Special Problem	5		10		150	
ATT 2916	Special Problem	6		12		180	
ATT 2931	Special Problem II in Automotive Tech.	1		2		30	
ATT 2932	Special Problem II	2		4		60	
ATT 2933	Special Problem II	3		6		90	
ATT 2934	Special Problem II	4		8		120	
ATT 2935	Special Problem II	5		10		150	
ATT 2936	Special Problem II	6		12		180	
ATT 2921	Supervised Work Experience in Automotive Tech	1		3		45	
ATT 2922	Supervised Work Experience in Automotive Tech	2		6		90	
ATT 2923	Supervised Work Experience in Automotive Tech	3		9		135	
ATT 2924	Supervised Work Experience in Automotive Tech	4		12		180	
ATT 2925	Supervised Work Experience in Automotive Tech	5		15		225	
ATT 2926	Supervised Work Experience in Automotive Tech	6		18		270	
WBL 1911	Work Based Learning	1-6		3-18		45-270	
	All approved electives per local community college			2			

Course Number and Name: ATT 1124 Basic Electrical/Electronic Systems

Description: This is a course designed to provide advanced skills and knowledge related to the components of the vehicle electrical system including lights, battery, stating and charging components.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
3	2	2	30

Prerequisite: None

Student Learning Outcomes:

For every task in *Electrical/Electronic Systems* the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VI. ELECTRICAL/ELECTRONIC SYSTEMS

General: Electrical System Diagnosis

1. Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
3. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.
4. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
5. Demonstrate proper use of a test light on an electrical circuit. (MLR a 6)
6. Use fused jumper wires to check operation of electrical circuits. (MLR a 7)
7. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems. (MLR3)
8. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.(MLR a 8)
9. Inspect and test fusible links, circuit breakers, and fuses; determine needed action. (MLR a 9)
10. Inspect and test fusible links, circuit breakers, and fuses; determine needed action. (MLR a 9)
11. Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.(MLR a10)
12. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.
13. Repair data bus wiring harness.
14. Identify electrical/electronic system components and configurations (Only MLR a 11)

VI. ELECTRICAL/ELECTRONIC SYSTEMS

B. Batteries (Conventional 12-volt)

1. Perform battery state-of-charge test; determine needed action. P-1
2. Confirm proper battery capacity, size, type, and application for vehicle; perform battery capacity and load test. P-1
3. Maintain or restore electronic memory functions as recommended by manufacturer. P-2
4. Inspect and clean battery; fill battery cells (if applicable); check battery cables, connectors, clamps, and hold-downs. P1
5. Perform battery charging according to manufacturer's recommendations. P-1
6. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply. P-1
7. Identify electrical/electronic modules, security systems, radios, and other accessories that require initialization or code entry after reconnecting vehicle battery. P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS
C. Starting System
1. Perform starter current draw test. P-1
2. Perform starter circuit voltage drop tests. P-1
3. Inspect and test starter relays and solenoids. P-2
4. Remove and install starter in a vehicle. P-3
5. Inspect and test switches, connectors, and wires of starter control circuits. P-2
6. Demonstrate knowledge of an automatic idle-stop/start-stop system.
7. Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.(MLR c 5)
8. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.
9. Demonstrate knowledge of an automatic idle-stop/start-stop system.(MLR c 6) P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS
D. Charging System
1. Perform charging system output test. P-1
2. Inspect, adjust, and/or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. P-1
3. Remove, inspect, and/or replace generator (alternator). P-3
4. Perform charging circuit voltage drop tests.P-1
5. Diagnose charging system for causes of undercharge, no-charge, or overcharge conditions; determine needed action.P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS
E. Lighting Systems
1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. P-1

VI. ELECTRICAL/ELECTRONIC SYSTEMS
F. Instrument Cluster and Driver Information Systems
1. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required.P-1
2. Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action. P-2
3. Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action. P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS
G. Body Electrical Systems
1. Diagnose vehicle comfort, convenience, access, safety, and related systems operation; determine needed action.
2. Remove and reinstall door panel. P-2
3. Diagnose operation of security/anti-theft systems and related circuits (such as: theft deterrent, door locks, remote keyless entry, remote start, and starter/fuel disable); determine needed action. P-2
4. Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation. P-1
5. Verify windshield wiper and washer operation; replace wiper blades. P-1
6. Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed action. P-2
7. Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, parking assist, and back-up camera); determine needed action. P-2
8. Diagnose body electronic system circuits using a scan tool; check for module communication errors (data

communication bus systems); determine needed action. P-2
9. Describe the process for software transfer, software updates, or reprogramming of electronic modules. P-2

Course Number and Name: ATT 1134 Advanced Electrical/Electronic Systems

Classification: Career Certificate Core Requirement

Description: This is a course designed to provide advanced skills and knowledge related to the components of the vehicle electrical system including gauges, driver information systems, horn, wiper/washer systems, and accessories.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Electrical/Electronic Systems* the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VI. ELECTRICAL/ELECTRONIC SYSTEMS
F. Instrument Cluster and Driver Information Systems
1. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators as required. P-1
2. Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action. Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action. P-1
3. Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action. P-2

VI. ELECTRICAL/ELECTRONIC SYSTEMS
G. Body Electrical Systems
1. Demonstrate understanding of vehicle comfort, convenience, access, safety, and related systems operation. P-1
2. Remove and reinstall door panel. P-1
3. Describe the operation of keyless entry/remote-start systems. P-2
4. Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation. P-2
5. Verify windshield wiper and washer operation; replace wiper blades. P-1
6. Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed action. P-2
7. Diagnose operation of safety systems and related circuits (such as: horn, airbags, seat belt pretensioners, occupancy classification, wipers, washers, speed control/collision avoidance, heads-up display, parking assist, and back-up camera); determine needed action. P-2
8. Diagnose body electronic system circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action. P-2
9. Describe the process for software transfer, software updates, or reprogramming of electronic modules. P-2

Course Number and Name**:** ATT 1214 Brakes

Classification: Career Certificate Core Requirement

Description: This is a course designed to provide advanced skills and knowledge related to the repair and maintenance of brake systems on automobiles. It includes instruction and practice in diagnosis of braking systems problems and the repair of brake systems.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Brakes* the following safety requirement must be strictly enforced:
Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

V. BRAKES
A. General
1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify brake system components and configurations. P-1
3. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).
5. Install wheel and torque lug nuts. P-1
6. Identify and interpret brake system concerns; determine needed action. P-1

V. BRAKES
B. Hydraulic System
1. Demonstrate understanding of hydraulic principals (Pascal's law). P-1
2. Describe proper brake pedal height, travel, and feel. P-1
3. Check master cylinder for proper operation. P-1
4. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports.P-1
5. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. P-1
6. Identify components of hydraulic brake warning light system. P-3
7. Bleed and/or replace fluid in the brake system.
8. Test brake fluid contamination. P-1
9. Remove, bench bleed, and reinstall master cylinder. P-1
10. Diagnose poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determine needed action. P-1
11. Replace brake lines, hoses, fittings, and supports. P-2
12. Fabricate brake lines using proper material and flaring procedures. P-2
13. Inspect, test, and/or replace components of brake warning light system. P-3

V. BRAKES

C. Drum Brakes
1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. P-2
2. Refinish brake drum and measure final drum diameter; compare with specification. P-2
3. Remove, clean, inspect, and/or replace 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; perform final checks and adjustments. P-2
6. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pedal pulsation concerns; determine needed action. P-2

V. BRAKES
D. Disc Brakes
1. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action. P-1
2. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action. P-1
3. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action. P-1
4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads against rotor; inspect for leaks. P-1
5. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. P-1
6. Remove and reinstall/replace rotor. P-1
7. Refinish rotor on vehicle; measure final rotor thickness and compare with specification. P-1
8. Refinish rotor off vehicle; measure final rotor thickness and compare with specification. P-2
9. Retract and re-adjust caliper piston on an integrated parking brake system. P-1
10. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendation. P-2
11. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action. P-1

V. BRAKES
E. Power-Assist Units
1. Check brake pedal travel with and without engine running to verify proper power booster operation. P-2
2. Identify components of the brake power assist system (vacuum/ hydraulic/electric). P-2
3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster; determine needed action.
4. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine needed action.

V. BRAKES
F. Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical)
1. Remove, clean, inspect, repack/replace, and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings. P-3
2. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.P-2
3. Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation. P-2
4. Check operation of brake stop light system. P-1
5. Inspect and replace wheel studs. P-2
6. Remove, reinstall, and/or replace sealed wheel bearing assembly. P-1
7. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed actions

V. BRAKES

G. Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS) and Electronic Stability Control (ESC) Systems

1. Identify electronic brake control system components and describe function (ABS, TCS, ESC). P-2
2. Describe the operation of a regenerative braking system. P-3
3. Bleed the electronic brake control system hydraulic circuits. P-1

Course Number and Name: ATT Manual Drive Trains/Transaxels

Classification: Technical Certificate Core Requirement

Description: This is a course designed to provide advanced skills and knowledge related to the maintenance and repair of manual transmissions, transaxles, and drive train components. It includes instruction in the diagnosis of drive train problems, and the repair and maintenance of transmissions, transaxles, clutches, CV joints, differentials, and other components.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
3	1	4	75

Prerequisite: Instructor Approved Student Learning Outcomes:

For every task in *Manual Drive Trains and Axles* the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

III. MANUAL DRIVE TRAIN AND AXLES
A. General
1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify manual drive train and axles components and configurations. P-1
3. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Check fluid condition; check for leaks; determine needed action. P-1
5. Drain and refill manual transmission/transaxle; use proper fluid type per manufacturer specification. P-1
6. Diagnose drive train concerns; determine needed action. P-1

III. MANUAL DRIVE TRAIN AND AXLES
B. Clutch
1. Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification. P-2
2. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action. P-2
3. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; determine needed action. P-2
4. Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable). P-2
5. Bleed clutch hydraulic system. P-2
6. Inspect flywheel and ring gear for wear and cracks, and discoloration; determine needed action. P-2
7. Measure flywheel runout and crankshaft end play; determine needed action. P-2
8. Describe the operation and service of a system that uses a dual mass flywheel. P-3

III. MANUAL DRIVE TRAIN AND AXLES
C. Transmission/Transaxle
1. Describe the operational characteristics of an electronically controlled manual transmission/transaxle. P-2
2. Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers. P-2

III. MANUAL DRIVE TRAIN AND AXLES
D. Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joints (Front, Rear, All-wheel, Four-wheel Drive)
1. Inspect and/or remove/replace bearings, hubs, and seals. P-1
2. Inspect and/or service/replace shafts, yokes, boots, and universal/CV joints. P-1
3. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2
4. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.P-1
5. Diagnose universal joint noise and vibration concerns; determine needed action. P-1
6. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles; determine needed action. P-2

III. MANUAL DRIVE TRAIN AND AXLES
E. Differential and Drive Axles
E.1 Ring and Pinion Gears and Differential Housing Assembly
1. Inspect differential housing; check for leaks; inspect housing vent. P-1
2. Check and adjust differential housing fluid level; use proper fluid type per manufacturer specification. P-1
3. Drain and refill differential housing; using proper fluid type per manufacturer specification. P-1
4. Inspect and replace companion flange and/or pinion seal; measure companion flange runout. P-2
5. Demonstrate knowledge of drive pinion and ring gear services and set up including depth, preload, backlash and gear tooth contact. P-2

E.2 Drive Axles
1. Inspect and replace drive axle wheel studs. P-2
2. Remove and replace drive axle shafts. P-1
3. Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
4. Measure drive axle flange runout and shaft end play; determine needed action. P-2

III. MANUAL DRIVE TRAIN AND AXLES
F. Four-wheel Drive/All-wheel Drive
1. Identify concerns related to variations in tire circumference and/or final drive ratios. P-2
2. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-2
3. Inspect axle locking mechanisms; determine needed action(s). P-3
4. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. P-2

Course Number and Name: ATT 1424 Engine Performance I

Description: This is a course designed to provide basic skills and knowledge related to the engine mechanicals, ignition system, fuel, air induction, exhaust systems, and emission systems. It includes instruction, diagnosis, and correction of problems associated with in these areas.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Engine Performance* the following safety requirement must be strictly enforced:
Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VIII.ENGINE PERFORMANCE
A. General
1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Demonstrate understanding of proper engine cooling system operation. P-1
4. Demonstrate understanding of camshaft timing including engines equipped with variable valve timing (VVT) systems. P-1

VIII. ENGINE PERFORMANCE
B. Computerized Control
1. Identify computerized control system components and configurations. P-1

VII. ENGINE PERFORMANCE
C. Ignition System
1. Identify ignition system components and configurations.P-1
2. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-2

VIII.ENGINE PERFORMANCE
D. Fuel, Air Induction, and Exhaust Systems
1. Identify fuel, air induction, and exhaust system components and configurations. P-1
2. Replace fuel filter(s) where applicable.P-2
3. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1
4. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields. P-1
5. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields. P-1
6. Check and refill diesel exhaust fluid (DEF).P-3

VIII. ENGINE PERFORMANCE
D. Fuel, Air Induction, and Exhaust Systems
1. Identify fuel, air induction, and exhaust system components and configurations.P-1
2. Replace fuel filter(s) where applicable.P-2
3. Inspect, service, or replace air filters, filter housings, and intake duct work.P-1

4. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields. P-1
5. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields. P-1
6. Check and refill diesel exhaust fluid (DEF). P-3

VIII. ENGINE PERFORMANCE
E. Emissions Control Systems
1. Identify emission control system components and configurations. P-1
2. Inspect, test, and service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses. P-2

Course Number and Name: ATT 1715 Engine Repair

Classification: Career Certificate Core Requirements

Description: This is a course designed to provide advanced skills and knowledge related to the repair and rebuilding of automotive engines. It includes instruction and practice in the diagnosis and repair of engine components including valve trains, blocks, pistons and connecting rods, crankshafts, and oil pumps.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
5	2	6	120

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Engine Repair* the following safety requirement must be strictly enforced:
Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

I. ENGINE REPAIR
A. General
1. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).P-1
2. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Verify operation of the instrument panel engine warning indicators. P-1
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action. P-1
5. Install engine covers using gaskets, seals, and sealers as required. P-1
6. Verify engine mechanical timing. P-1
7. Inspect, remove, and/or replace engine mounts. P-2
8. Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle. P-2

2. ENGINE REPAIR
B. Cylinder Head and Valve Train
1. Identify cylinder head and valve train components and configurations. P-1
2. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure. P-1
3. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition. P-2

3.ENGINE REPAIR

C. Engine Block Assembly

1. Identify engine block assembly components and configurations. P-1
2. Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer). P-2

4. Lubrication and Cooling Systems

1. Identify lubrication and cooling system components and configurations. P-1
2. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required. P-1
3. 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 needed action. P-1
4. Identify causes of engine overheating. P-1
5. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. P-1
6. Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required. P-1
7. Inspect, remove, and replace water pump. P-2
8. Remove, inspect, and replace thermostat and gasket/seal. P-1
9. Remove and replace radiator. P-2
10. Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action. P-1
11. Perform oil pressure tests; determine needed action. P-1
12. Inspect auxiliary coolers; determine needed action. P-2
13. Inspect, test, and/or replace oil temperature and pressure switches and sensors. P-2

Course Number and Name**:** ATT 1811 Introduction, Safety and Employment

Classification: Career Certificate Core Requirement

Description: This is a course designed to provide knowledge of classroom and lab policies and procedures. Safety practices and procedures associated with the automotive program and automotive industry.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
1	1	0	15

Prerequisite: Instructor Approved

Student Learning Outcomes:

The student will comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

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.
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. Identify vehicle systems which pose a safety hazard during service such as: supplemental restraint systems (SRS), electronic brake control systems, stop/start systems, and remote start systems.
14. Identify vehicle systems which pose a safety hazard during service due to high voltage such as: hybrid/electric drivetrain, lighting systems, ignition systems, A/C systems, injection systems, etc.

15 Locate and demonstrate knowledge of safety data sheets (SDS).

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 (e.g., micrometer, dial-indicator, dial-caliper).
6. Perform common fastener and thread repair, including removing broken bolts, restoring internal and external threads, and repairing internal threads with a thread insert.

Preparing for Vehicle Service

1. Identify information needed and the service requested on a repair order.
2. Identify purpose and demonstrate proper use of vehicle protection such as: fender covers, mats, seat, and

steering wheel covers.
3. Perform a vehicle walk-around inspection; identify and document existing vehicle conditions such as body damage, paint damage, windshield damage.
4. Perform a vehicle multi-point inspection and complete a vehicle inspection report.
5. Demonstrate use of the three C's (concern, cause, and correction).
6. Create a plan of action for each specific service or diagnostic situation.
7. Review vehicle service history.
8. 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.).

Course Number and Name: ATT 2112 Introduction to Light Duty Diesel Technology, Tools, and Safety

Description: This course introduces basic knowledge and skills the student must have to succeed in the Diesel Equipment Technology field. Topics include an overview of diesel powered vehicles, diesel technology safety skills, basic tools and equipment, reference materials, measuring instruments, shop operation, mechanical fasteners, welding safety, and basic welding skills. Classroom and lab experiences on safety, precision measuring, and basic shop practices are highly emphasized.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
2	1	2	45

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Demonstrate basic knowledge and skills of the light duty diesel automotive field.
a. Identify common diesel powered vehicles.
b. Identify major functional areas of vehicles.
c. Explain gross vehicle weight ranges for on-road truck weigh classifications.
d. Identify axle and drive wheel configurations.
e. Explain basic truck cab designs.
f. Verify the complaint, and road/dyno test vehicle; review driver/customer concerns/expectations and vehicle service history (if available); determine further diagnosis.
g. Record vehicle identification number (VIN). Identify engine model, calibration and serial numbers to research applicable vehicle and service information, service precautions, and technical service bulletins, determine needed actions.
h. Perform scan tool check and visual inspection for physical damage and missing, modified, or tampered components; determine needed actions.
i. Check and record electronic diagnostic codes, freeze frame and /or operational data; monitor scan tool data, determine further diagnosis.
j. Clear diagnostic trouble codes (DTCs) and verify the repair.
k. Inspect engine assembly and compartment for fuel, oil, coolant, exhaust, or other leaks; determine needed repairs.
l. Inspect engine compartment wiring harness, connectors, seals, and locks; check for proper routing and condition; determine needed repairs.
m. Listen for and isolate engine noises; determine needed repairs.
n. Isolate and diagnose engine related vibration problems; determine needed actions.
o. Check engine exhaust for abnormal odor and /or smoke color and volume; determine further diagnosis.
p. Check fuel for contamination, quantity, quality, and consumption; determine needed actions.
q. Perform crankcase pressure test; determine further diagnosis.
r. Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed actions.
s. Check cooling system for freeze point, level, contamination, condition, temperature, pressure, circulation, and fan operation, determine needed repairs.

2. Identify and apply light diesel technology safety skills.
a. Identify and use personal protective equipment.
b. Identify how to lift and move items safely.
c. Identify fire types, fire safety, fire extinguishers and their operation.
d. Identify OSHA's role in workplace health and safety.
e. Identify the hazardous materials and hazardous waste issues related to shop operation.

f. Identify information on material safety data sheets (MSDS).
g. Identify hazardous waste products associated with the diesel technology shop.
h. Explain electrical safety guidelines.
i. Define general safety guidelines for working on vehicles.

3. Identify and properly utilize basic Tools and Equipment
a. Identify hand tools required for diesel repair.
b. Identify shop tools required for diesel repair.
c. Identify specialty tools required for diesel repair.
d. Demonstrate correct methods of using and maintaining basic hand tools.
e. Demonstrate correct methods of using and maintaining basic power tools.
f. Understand and demonstrate use of metric and standard hand tools.

4. Determine the proper measuring I instruments used in light duty repair.
a. Identify basic units of measurement found on rules.
b. Identify, explain and demonstrate use of non-precision measuring devices used in diesel repair.
c. Identify rules for use and care of precision and non-precision measuring devices.

Course Number and Name: ATT 2125 Light Duty Diesel Engine Repair

Description: This course covers the theory, construction, inspection, diagnosis, and repair of internal combustion engines and related systems to light duty diesel. Topics include fundamental operating principles of engines and diagnosis, inspection, adjustment, and repair of automotive engines using appropriate service information. Upon completion, students should be able to perform basic diagnosis, measurement and repair of light duty diesel engines using appropriate tools, equipment, procedures, and service information.

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
5	2	6	120

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Analyze and troubleshoot basic light duty diesel engine concerns.
a. Inspect fuel, oil, and coolant levels and condition.
b. Identify the causes of engine fuel, oil, coolant, air, and other leaks.
c. Listen for engine noises.
d. Observe engine exhaust smoke color and quantity.
e. Identify causes of no cranking, cranks but fails to start hard starting, and starts but does not continue to run problems.
f. Identify causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems.
g. Identify engine vibration problems.

2. Analyze and troubleshoot basic light duty diesel cylinder head and valve train.
a. Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.
b. Clean and inspect threaded holes, studs, and bolts for serviceability.
c. Inspect cylinder head for cracks/damage, check mating surfaces for warpage, check condition of passages, inspect core/expansion and gallery plugs.
d. Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals.
e. Measure valve head height relative to deck and valve face-to-seat contact.
f. Inspect injector sleeves and seals, measure injector tip or nozzle protrusion.
g. Inspect valve train components.
h. Reassemble cylinder head.
i. Inspect, measure, and replace/reinstall overhead camshaft.
j. Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness.
k. Adjust valve bridges; adjust valve clearances and injector settings.

3. Analyze and troubleshoot basic light duty diesel engine blocks.
a. Perform crankcase pressure test.
b. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
c. Check condition of piston cooling jets.
d. Inspect and measure crankshaft vibration damper.
e. Install and align flywheel house, inspect flywheel housing to transmission housing/engine mating surface and measure flywheel housing face and bore runout.
f. Inspect flywheel/flexplate and mounting surfaces for cracks and wear, measure runout.

4. Inspect and diagnose lubrication systems.
a. Test engine oil pressure check operation of pressure sensor, gauage and/or sending union; test engine oil temperature and check operation of temperature sensor.
b. Check engine oil level, condition and consumption.
c. Inspect and measure oil pump, drives, inlet pipes, and pick up screens; check drive gear clearances.
d. Inspect oil pressure regulator valve, by-pass and pressure relief valve, oil thermostat, and filters.
e. Inspect, clean, and test oil cooler and components.
f. Inspect turbocharger lubrication and cooling systems.
g. Determine proper lubricant and perform oil and filter change.

5. Inspect diagnose light duty diesel cooling system
a. Check engine coolant type, level, condition, and consumption, test coolant for freeze protection and additive package concentration.
b. Test coolant temperature and check operation of temperature and level sensors, gauge, and /or sending unit.
c. Inspect and reinstall/replace pulleys, tensioners and drive belts.
d. Inspect thermostats, by-passes, housing and seals.
e. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
f. Inspect coolant conditioner/filter assembly for leaks, inspect valves, lines, and fittings.
g. Inspect water pump and hoses.
h. Inspect, clean, and pressure test radiator, pressure cap, tank and recovery systems.
Inspect thermostatic cooling fan system and fan shroud.

Course Number and Name**:** ATT 2214 Light Duty Diesel Engine Performance

Classification: Career Certificate Core Requirement

Description: This course covers terminology, theory and operation of air induction and boost technologies, exhaust, and emission controls used in light-duty diesel engines. Topics include component identification, operation, diagnosis and repair of air delivery systems including turbochargers, diesel particulate filters and other exhaust catalysts. Upon completion, students should be able to demonstrate skills necessary to research service information, and inspect, test, and repair induction, boost, and after-treatment components**.**

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
4	2	4	90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Diagnose and repair light duty diesel air induction, exhaust systems and engine brakes.
a. Perform air intake system restriction and leakage tests.
b. Perform intake manifold pressure (boost) test.
c. Perform exhaust back pressure test.
d. Inspect turbocharger(s), wastegate, and piping systems.
e. Inspect and test turbocharger(s) (variable ratio/geometry), pneumatic, hydraulic, electronic controls, and actuators.
f. Check air induction system: piping, hoses, clamps, and mounting; service or replace air filter.
g. Remove and reinstall turbocharger/wastegate assembly.
h. Inspect intake manifold, gaskets, and connections.
i. Inspect exhaust manifold, piping, mufflers, and mounting hardware.
j. Inspect exhaust after treatment devices.
k. Inspect and test preheater/inlet air heater or glow plug system and controls.
l. Inspect and adjust engine compression/exhaust brakes.
m. Inspect, test, and adjust engine compression/exhaust.
n. Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings.

2. Identify, inspect and analyze fuel supply systems.
a. Check fuel level and condition.
b. Perform fuel supply and return system tests.
c. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings
d. Inspect clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware.
e. Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings.
f. Check fuel system for air.
g. Inspect, clean, test, and repair/replace fuel transfer and/or supply pump, sensors, strainers, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates (if applicable), and mounting hardware.
h. Check fuel system for air, determine needed repairs; prime and bleed fuel system, check and repair/replace primer pump.
i. Inspect, test, and repair/replace low fuel pressure regulator supply and return systems, including low pressure switches.
j. Inspect, and reinstall/replace high-pressure injection lines, fittings, transfer tubes, seals, and mounting hardware.
k. Inspect, adjust, and repair/replace electronic throttle and PTO control devices, circuits, and sensors

l. Perform on-engine inspections, tests, and replace high pressure common rail fuel system components and electronic controls.
m. Perform on-engine inspections and tests; replace hydraulic electronic unit injector(s) (HEUI) components and electronic controls.
n. Perform on-engine inspections and tests; replace pump-line-nozzle fuel system (PLN-E) components and electronic controls.
o. Perform on-engine inspections and tests; replace electronic unit injector(s) (EUI) components and electronic controls.
p. Inspect and replace electrical connector terminals, pins, harnesses, seals, and locks.
q. Connect diagnostic scan tool to vehicle/engine; access, verify and update software calibration settings, injector calibration codes; perform control module re-learn procedures as needed.

3. Identify, inspect and analyze electronic fuel management system.
a. Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter
b. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools.
c. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; and clear codes.
d. Locate and use relevant service information.
e. Inspect and replace electrical connector terminals, seals, and locks.
f. Inspect and test switches, sensors, controls, actuator components, and circuits.
g. Using recommended electronic diagnostic tools, access and interpret customer programmable parameters.
h. Inspect, test, and adjust electronic unit injectors.
i. Remove and install electronic unit injectors and related components.
j. Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
k.Perform on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls.
l. Perform on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems
m. Perform on-engine inspections and tests on common rail type injection systems.
n. Inspect high pressure injection lines, hold downs, fittings and seals.
o. Use a diagnostic scan tool to inspect and test electronic engine control system, sensors, actuators, electronic control modules, and circuits; determine further diagnosis.
p. Measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM) or appropriate test equipment.
q. Diagnose engine problems resulting from failures of interrelated systems (for example: cruise control, security alarms/theft deterrent, transmission controls, exhaust after treatment systems, electronic stability control, or non-OEM installed accessories).

Course Number and Name**:** ATT 2224 Light Duty Diesel Electrical

Description: This course covers the theory and operation of electric-drive diesel vehicles. Topics include maintenance, diagnosis, repair and safety procedures for electrically propelled diesel vehicles. Upon completion, students should be able to perform diagnostics, maintenance and repairs on electric and hybrid diesel vehicles

Hour Breakdown:

Semester Credit Hours	Lecture	Lab	Contact Hours
4	2	4	90

Prerequisite: Instructor approved

Student Learning Outcomes:

1. Demonstrate theory and analyze operation of light duty diesel electrical systems.
a. Read and interpret electrical/electronic circuits using wiring diagrams.
b. Check continuity in electrical/electronic circuits using appropriate test equipment.
c. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.
d. Check current flow in electrical/electronic circuits and components using appropriate test equipment.
e. Check resistance in electrical/electronic circuits and components using appropriate test equipment.
f. Locate shorts, grounds and opens in electrical/electronic circuits.
g. Identify parasitic battery drain problems, and perform tests.
h. Inspect and test fusible links, circuit breakers, relays solenoids, and fuses.
i. Inspect and test spike suppression devices.
j. Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.
l. Perform battery load test.
m. Determine battery state of charge using an open circuit voltage test.
n. Inspect, clean, and service battery.
o. Inspect and clean battery boxes, mounts, and hold downs.
p. Charge battery using slow or fast charge method as appropriate.
q. Inspect, test, and clean battery cables and connectors.
r. Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures.
s. Perform battery capacitance test.
t. Perform fuel supply and return systems tests.
u. Inspect fuel tanks, vents, caps, mounts, valves, scr4eens, crossover system, supply and return lines and fittings.
v. Inspect clean, and test fuel transfer pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware.
w. Inspect and test low pressure regulator systems.
x. Check fuel system for air.

2. Diagnose and demonstrate electronic fuel management systems.
a. Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter.
b. Interface with vehicle's on-board computer, perform diagnostic procedures using recommended electronic diagnostic equipment and tools.

c. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data, and clear codes.
d. Locate and use relevant service information.
e. Inspect and replace electrical connector terminals, seals, and locks.
f. Inspect and test switches, sensors, controls, actuator components, and circuits.
g. Using recommended electronic diagnostic tools.
h. Inspect, test, and adjust electronic unit injectors.
i. Remove and install electronic unit injectors.
j. Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
k. Perform on engine inspections and tests on hydraulic unit injectors and system electronic controls.
l. Perform on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems.
m. Perform on engine inspections and test on common rail type injections systems.
n. Inspect high pressure injection lines, hold downs, fittings, and seals.

Course Number and Name**:** ATT 2324 Automatic Transmissions/Transaxels

Description: This is a course designed to provide advanced skills and knowledge related to the diagnosis of automatic transmissions and transaxles. This course includes instruction and practice of testing, inspecting, and repairing/replacing of these devices.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Automatic Transmission and Transaxle* the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

II. AUTOMATIC TRANSMISSION AND TRANSAXLE
A. General
1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify automatic transmission and transaxle components and configurations. P-1
3. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle equipped with a dipstick. P-1
5. Inspect transmission fluid condition; check fluid level; inspect for leaks on transmission or transaxle not equipped with a dipstick. P-1
6. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.P-1
7. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law). P-2
8. Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action. P-1
9. Diagnose fluid loss and condition concerns; determine needed action. P-1
10. Perform stall test; determine needed action. P-2
11. Perform lock-up converter system tests; determine needed action. P-3
12. Perform pressure tests on transmissions/transaxles equipped with electronic pressure control; determine needed action. P-3
13. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information. P-1

II. AUTOMATIC TRANSMISSION AND TRANSAXLE
B. In-Vehicle Transmission/Transaxle
1. Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch. P-2
2. Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification. P-1
3. Perform relearn procedures. P-2
4. Inspect, replace and/or align power train mounts. P-1
5. Inspect for leakage; replace external seals, gaskets, and bushings. P-2

6. Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits. P-1

II. AUTOMATIC TRANSMISSION AND TRANSAXLE

C. Off-Vehicle Transmission and Transaxle

1. Describe the operational characteristics of a continuously variable transmission (CVT). P-2
2. Describe the operational characteristics of a hybrid vehicle drive train. P-2
3. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces. P-2
4. Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings. P-1
5. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore. P-2

Course Number and Name: ATT 2434 Engine Performance II

Classification: Technical Certificate Core Requirement

Description: This is a course designed to provide intermediate skills and knowledge related to the ignition system, fuel, air induction, exhaust systems, and emission systems. It includes instruction, diagnosis, and correction of problems associated with in these areas.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Engine Performance* the following safety requirement must be strictly enforced:
Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VIII. ENGINE PERFORMANCE
A. General
1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Demonstrate understanding of proper engine cooling system operation. P-1
4. Demonstrate understanding of camshaft timing including engines equipped with variable valve timing (VVT) systems. P-1

VIII. ENGINE PERFORMANCE
B. Computerized Controls
1. Identify computerized control system components and configurations. P-1

VII. ENGINE PERFORMANCE
C. Ignition System
1. Identify ignition system components and configurations. P-1
2. Remove and replace spark plugs; inspect secondary ignition components for wear and damage. P-2

VIII. ENGINE PERFORMANCE
D. Fuel, Air Induction, and Exhaust Systems
1. Identify fuel, air induction, and exhaust system components and configurations. P-1
2. Replace fuel filter(s) where applicable. P-2
3. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1
4. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields. P-1
5. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields. P-1
6. Check and refill diesel exhaust fluid (DEF). P-3

VIII. ENGINE PERFORMANCE

E. Emissions Control Systems

1. Identify emission control system components and configurations. P-1

2. Inspect, test, and service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses. P-2

Course Number and Name: ATT 2334 Steering and Suspension Systems

Description: This is a course designed to provide advanced skills and knowledge related to the inspection and repair of steering and suspension systems of automobiles. This course includes instruction and practice in the diagnosis of steering system problems and the repair/replacement of steering/suspension components.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Suspension and Steering* the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

IV. SUSPENSION AND STEERING
A. General
1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Demonstrate understanding of proper engine cooling system operation. P-1
3. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Demonstrate understanding of camshaft timing including engines equipped with variable valve timing (VVT) systems. P-1
5. Identify and interpret suspension and steering system concerns; determine needed action.

IV. SUSPENSION AND STEERING
B. Steering Systems
1. Inspect rack and pinion steering gear tie rod ends (sockets) and bellows boots; repair or replace as needed. P-1
2. Inspect power steering fluid level and condition. P-2
3. Drain and replace power steering system fluid; use proper fluid type per manufacturer specification. P-2
4. Inspect for power steering fluid leakage; determine needed action. P-2
5. Remove, inspect, replace, and/or adjust power steering pump drive belt. P-2
6. Inspect, remove, and/or replace power steering hoses and fittings. P-2
7. Inspect, remove, and/or replace pitman arm, relay (center link/intermediate) rod, idler arm, mountings, and steering linkage damper. P-2
8. Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps (non- rack and pinion). P-2
9. Inspect and test electric power steering system; determine needed action. P-1
10. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring). P-1
11. Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action. P-2
12. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action. P-3
13. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action. P-1
14. Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and Steering wheel; determine needed action. P-2
15. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets. P-2

16. Remove and reinstall power steering pump. P-2
17. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment. P-2

IV. SUSPENSION AND STEERING
C. Suspension Systems
1. Inspect, remove, and/or replace upper and/or lower control arms, bushings, and shafts. P-2
2. Inspect and replace rebound/jounce bumpers. P-2
3. Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings. P-2
4. Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators). P-2
5. Inspect, remove, and/or replace suspension system coil springs and spring insulators. P-2
6. Inspect, remove, and/or replace torsion bars and mounts. P-3
7. Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links. P-2
8. Inspect, remove, and/or replace strut assembly, strut coil spring, insulators, and upper strut bearing mount. P-2
9. Inspect, remove, and/or replace components of suspension systems (Coil, Leaf, and Torsion). P-1
10. Inspect, remove, and/or replace components of electronically controlled suspension systems. P-1
11. Inspect, remove, and/or replace steering knuckle assemblies. P-2
12. Diagnose suspension system noises, body sway, and uneven ride height concerns; determine needed action. P-1

IV. SUSPENSION AND STEERING
D. Related Suspension and Steering Service
1. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings P-2
2. Inspect, service, and/or replace front and rear wheel bearings. P-1
3. Describe the function of electronically controlled suspension and steering systems and components, (i.e., active suspension and stability control). P-2

IV. SUSPENSION AND STEERING
E. Wheel Alignment
1. Perform pre-alignment inspection; measure vehicle ride height; determine needed action. P-1
2. Describe four-wheel alignment angles (camber, caster, and toe) and effects on vehicle handling\tire wear. P-1
3. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front caster, front and rear camber, and toe as required; center steering wheel. P-1
4. Check toe-out-on-turns (turning radius); determine needed action. P-2
5. Check steering axis inclination (SAI) and included angle; determine needed action. P-2
6. Check rear wheel thrust angle; determine needed action. P-1
7. Check for front wheel setback; determine needed action. P-2
8. Identify front and/or rear cradle (subframe) misalignment; determine needed action. P-2
9. Reset steering angle sensor. P-1
10. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering Return concerns; determine needed action. P-1

IV. SUSPENSION AND STEERING
F. Wheels and Tires
1. Inspect tire condition/age; identify tire wear patterns; check for correct tire size, application (service-class, load, and speed ratings), and air pressure as listed on the tire information placard/label. P-1
2. Rotate tires according to manufacturer's recommendation including vehicles equipped with tire pressure monitoring systems (TPMS) P-1
3. Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly. P-1
4. Inspect tire and wheel assembly for air loss; determine needed action. P-1
5. Repair tire following tire manufacturer approved procedure. P-1
6. Identify indirect and direct tire pressure monitoring system (TPMS); calibrate/relearn system; verify operation of instrument panel lamps. P-1
7. Demonstrate knowledge of steps required to remove and replace sensors (per OEM/sensor manufacturer) in a tire pressure monitoring system (TPMS). P-1
8. Perform Road Force balance/match mounting. P-1
9. Diagnose wheel/tire vibration, shimmy, and noise; determine needed action. P-1

10. Measure wheel, tire, axle flange, and hub runout; determine needed action. P-2
11. Diagnose tire pull problems; determine needed action. P-1

Course Number and Name: ATT 2444 Engine Performance

Description: This is a course designed to provide advanced skills and knowledge related to the ignition system, fuel, air induction, exhaust systems, and emission systems. It includes instruction, diagnosis, and correction of problems associated with in these areas.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Engine Performance* the following safety requirement must be strictly enforced:
Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VII ENGINE PERFORMANCE
A. General
1. Research vehicle service information such as fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
3. Verify proper engine cooling system operation; determine needed action. P-1
4. Verify correct camshaft timing including engines equipped with variable valve timing (VVT) systems; determine needed action. P-1
5. Identify and interpret engine performance concerns; determine needed action. P-1
6. Diagnose abnormal engine noises or vibration concerns; determine needed action. P-2
7. Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action. P-2
8. Perform engine manifold pressure tests (vacuum/boost); determine needed action. P-1
9. Perform cylinder power balance test; determine needed action. P-1
10. Perform cylinder cranking and running compression tests; determine needed action. P-1
11. Perform cylinder leakage test; determine needed action. P-1
12. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action. P-1

VIII. ENGINE PERFORMANCE
B. Computerized Controls
1. Identify computerized control system components and configurations. P-1

VIII. ENGINE PERFORMANCE
C. Ignition System
1. Identify ignition system components and configurations. P-1
2. Remove and replace spark plugs; inspect secondary ignition components for wear and damage; determine needed action. P-1

VIII. ENGINE PERFORMANCE
D. Fuel, Air Induction, and Exhaust Systems

1. Identify fuel, air induction, and exhaust system components and configurations. P-1
2. Replace fuel filter(s) where applicable. P-2
3. Inspect, service, or replace air filters, filter housings, and intake duct work. P-1
4. Check and refill diesel exhaust fluid (DEF). P-3
5. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s). P-1
6. Inspect, condition of exhaust system hangars, brackets, clamps, and heat shields. P-1

VIII. ENGINE PERFORMANCE
E. Emissions Control Systems
1. Identify emission control system components and configurations. P-1
2. Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; determine needed action. P-2

Course Number and Name: ATT 2614 Heating and Air Conditioning

Description: This course is designed to provide advanced skills and knowledge associated with the maintenance and repair of automotive heating and air conditioning systems. It includes instruction and practice in the diagnosis and repair of heating and air conditioning system components, and control systems.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task in *Heating and Air Conditioning* the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VII.HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
A. General
1. Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical
service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify heating, ventilation, and air conditioning (HVAC) components and configurations. P-1
3. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Identify steps of an A/C performance test. P-2
5. Identify abnormal operating noises in the A/C system. P-3
6. Visually inspect A/C system for signs of leaks. P-1
7. Identify and interpret heating and air conditioning problems. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
B. Refrigeration System Components
1. Inspect and/or replace A/C compressor drive belts, pulleys, and tensioners. P-1
2. Inspect for proper A/C condenser airflow. P-2
3. Inspect evaporator housing condensation drain. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair
1. Inspect engine cooling and heater systems hoses and pipes; perform needed action.(MLR c.1) P-1

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
D. Operating Systems and Related Controls Diagnosis and Repair
1. Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action. (MAST only)
2. Diagnose A/C compressor clutch control systems; determine needed action.(MAST only)
3. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action.(MAST only)

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
C. Heating, Ventilation, and Engine Cooling Systems
1. Inspect engine cooling and heater systems hoses and pipes. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
D. Operating Systems and Related Controls
1. Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets. P-1
2. Identify the source of HVAC system odors. P-2

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
E. Refrigerant Recovery, Recycling, and Handling
1. Demonstrate awareness of the need to recover, recycle, and handle refrigerants using proper equipment and procedures. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
A. General
1. Research vehicle service information, including refrigerant/oil/fluid type, vehicle service history, service precautions, technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS). P-1
2. Identify heating, ventilation, and air conditioning (HVAC) components and configurations. P-1
3. Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed. P-1
4. Identify steps of an A/C performance test. P-2
5. Identify abnormal operating noises in the A/C system. P-3
6. Visually inspect A/C system for signs of leaks. P-1
7. Identify and interpret heating and air conditioning problems. P-1

VII. HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)
B. Refrigeration System Components
1. Inspect and/or replace A/C compressor drive belts, pulleys, and tensioners. P-1
2. Inspect for proper A/C condenser airflow. P-2
3. Inspect evaporator housing condensation drain. P-1

Course Number and Name: ATT 2714 Light Duty Hybrid/Electric Vehicle Systems

Description: This course is designed to provide advanced skills and knowledge related to hybrid/electric vehicles. It includes instruction, diagnosis, and correction of problems associated within these area.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
4	2	4	90

Prerequisite: Instructor Approved

Student Learning Outcomes:
Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

A. Battery System
1. Perform high voltage disconnect procedure; reconnect/enable high voltage system.
2. Select, test and use proper safety gloves.
3. Select, quality and use proper electrical testing equipment and leads.
4. Retrieve and diagnose DTCs; damage or failed harnesses, connectors, terminals and fuses.
5. Diagnose high voltage (HV) battery pack malfunctions.
6. Remove and install high voltage battery pack.
7. Remove and install high voltage batter pack.
8. Test, diagnose and repair high voltage leaks/loss of isolation.
9. Test, diagnose and repair high voltage battery pack heating and cooling systems.
10. Test, diagnose, repair or replace high voltage battery pack internal components.
11. Test and diagnose charging problems when using electric vehicle supply equipment (EVSE)

B. Internal Combustion Engine
1. Retrieve and diagnose DTC's determine needed repairs.
2. Determine if the internal combustion engine (ICE) is in CRANK mode or RUN mode.
3. Differentiate between drive ability problems caused by the internal combustion engine and/or hybrid drive system.
4. Perform internal combustion engine cranking compression test.
5. Keep the internal combustion engine running during service.
6. Diagnose internal combustion engine no-crank condition.
7. Diagnose internal combustion engine cranks/no start condition.
8. Interpret vacuum and compression readings on Atkinson cycle engines.
9. Identify engine start/stop strategy; diagnose malfunctions.
10. Service engine cooling system.

C. Drive Systems
1. Perform high voltage disconnect procedure; reconnect/enable high voltage system.
2. Select, test and use proper safety gloves.
3. Select, qualify and use proper electrical testing equipment and leads.
4. Retrieve and diagnose driveline DTCs; determine needed repairs.
5. Diagnose problems cause by damaged or failed harnesses, connectors, and terminals.
6. Test, diagnose and repair high voltage leaks/loss of isolation.
7. Remove and install rotor from stator.

8. Diagnose motor-rotor position sensor (Resolver or Encoder type).
9. Diagnose drive/traction motor-generator assembly for improper operation (such as inoperative condition, noise, shudder, overheating, etc.).
10. Diagnose improper electrical actuated parking pawl operation; determine needed repair.
11. Identify transmission fluid and coolant fluid requirements; fluid levels.

D. Power Electronics
1. Perform high voltage disconnect procedure; reconnect/enable high voltage system.
2. Select, test and use proper safety gloves.
3. Select, quality and use proper electrical testing equipment and leads.
4. Retrieve and diagnose DTCs; determine needed repairs.
5. Diagnose problems cause by damaged or failed harnesses, connectors, and terminals.
6. Identify procedures necessary to establish the proper vehicle operational power mode during service (OFF, ACCESSORY, POWER ON, READY TO DRIVE).
7. Diagnose the cause of a hybrid system warning displayed on the instrument panel and/or a drive ability complaint.
8. Diagnose impact sensor problems; determine needed repair.
9. Diagnose AC/DC inverter over hearting; determine needed repair.
10. Diagnose AC/DC inverter failure; determine needed repair.
11. Replace AC/DC inverter cooling pump.
12. Remove and install AC/DC inverter.
13. Diagnose failures in the data communications bus network; determine needed repair.
14. Locate and test voltage level of capacitors.
15. Diagnose locate and safely disable/enable safety interlocks.
16. Diagnose failed DC/DC converter; determine needed repair.
17. Remove and install DC/DC converter.
18. Test high voltage cable integrity and loss of isolation.
19. Perform 12-volt battery testing.
20. Diagnose system main relay (SMR)/ contractor malfunctions; determine needed repairs.

Course Number and Name**:** ATT 293 (1-6) Special Problem I in Automotive Technology

Classification: Technical Elective

Description: A basic course to provide students with an opportunity to utilize basic skills and general knowledge gained in other Automotive Technology courses. The instructor and student work closely together to select a topic and establish criteria for completion of the project.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
1		2	30
2		4	60
3		6	90
4		8	120
5		10	150
6		12	180

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task completed in this course the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

1. Develop a written plan that details the activities and projects to be completed.
a. Use a written plan that details the activities and projects to be completed.
b. Perform written occupational objectives in the special problem.

2. Assess accomplishment of objectives.
a. Prepare daily written assessments of accomplishment of objectives.
b. Present weekly written reports to the instructor of activities performed and objectives accomplished.

3. Use and follow a set of written guidelines for the special problem.
a. Develop and follow a set of written guidelines for the special problem.

Course Number and Name**:** ATT 292 (1-6) Special Problems II in Automotive Technology

Classification: Technical Elective

Description: A continuation of Special Problem I in Automotive Technology. An advanced course to provide students with an opportunity to utilize advanced skills and specific knowledge gained in other Automotive Technology courses. The instructor and student work closely together to select a topic and establish criteria for completion of the project.

Hour Breakdown:

Scheduled Hours	Lecture	Lab	Clock Hours
1		2	30
2		4	60
3		6	90
4		8	120
5		10	150
6		12	180

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task completed in this course the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

1. Develop a written plan that details the activities and projects to be completed.
a. Use a written plan that details the activities and projects to be completed.
b. Perform written occupational objectives in the special problem.

2. Assess accomplishment of objectives.
a. Prepare daily written assessments of accomplishment of objectives.
b. Present weekly written reports to the instructor of activities performed and objectives accomplished.

3. Use and follow a set of written guidelines for the special problem.
a. Develop and follow a set of written guidelines for the special problem.

Course Number and Name: ATT 293 (1-6) Supervised Work Experience in Automotive Technology

Classification: Technical Electives

Description: A course that is a cooperative program between industry and education designed to integrate the student's technical studies with industrial experience. Variable credit is awarded on the basis of one semester hour per 45 industrial contact hours.

Hour Breakdown:

Scheduled Hours	Lecture	Externship	Clock Hours
1		3	45
2		6	90
3		9	135
4		12	180
5		15	225
6		18	270

Prerequisite: Instructor Approved

Student Learning Outcomes:

For every task completed in this course the following safety requirement must be strictly enforced:
Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

1. Follow a set of instructor-written guidelines for the supervised work experience program.

2. Apply skills needed to be a viable member of the workforce.
a. Prepare a description of skills to be developed in the supervised work experience program.
b. Practice skills needed to be a viable member of the workforce.

3. Practice human relationship skills in the supervised work experience program.

4. Practice positive work habits, responsibilities, and ethics.

5. Develop written occupational objectives in the supervised work experience program.

6. Assess performance of occupational skills.
a. Prepare daily written assessments of work performance as specified in the occupational objectives.
b. Present weekly written reports to the instructor of activities performed and objectives accomplished.

Appendix A: Recommended Tools and Equipment

(Contained in individual sets or the tool crib in sufficient quantities to permit efficient instruction)

1. Air Blow Gun (meeting OSHA requirements)
2. Allen (Wrench or Socket) Set - Standard (.050" - 3/8")
3. Allen (Wrench or Socket) Set - Metric (2mm - 8mm, 10mm, 12mm)
4. Battery Post Cleaner
5. Battery Terminal Pliers
6. Battery Terminal Puller
7. Chisels
    a. Cape 5/16"
    b. Cold 3/8", 3/4"
8. Chisel Holder
    a. Claw Type Pickup Tool
9. Combination Wrenches
    a. Standard (1/4" – 1 1/4")
    b. Metric (7mm - 24mm)
10. Crowfoot Wrench Set - Metric
    a. Crowfoot Wrench Set – Standard
    b. Ear Protection
11. Feeler Gauge (Blade Type)
    a. .002" - .040"
    b. .006mm - .070mm
12. Files
    a. Coarse 6" and 12"
    b. Fine 6" and 12"
    c. Half Round 12"
    d. Round 6" and 12"
13. Flare Nut (tubing) Wrenches:
    a. 3/8" - 3/4"
    b. 10mm - 17mm
14. Flashlight
15. Fuse Puller
16. Fused Jumper Wire Set (with various adapters)
17. Hack Saw
18. Hammers:
    a. 16 oz. Ball Peen
    b. Brass
    c. Dead Blow Plastic Mallet
    d. Plastic Tip
    e. Rubber Mallet
19. Inspection Mirror
20. Magnetic Pickup Tool
21. Pliers:
    a. Combination 6"
    b. Hose Clamp
    c. Locking Jaw
    d. Needle Nose 6"
    e. Side Cutting
    f. Slip Joint (Water Pump)
22. Pry Bars:
    a. Rolling Head

b. Straight

23. Punches:
    a. Center
    b. Brass Drift
    c. Pin 1/8", 3/16", 1/4", 5/16 "
    d. Taper 3/8", 1/2", 5/8"
24. Safety Glasses (meeting OSHA requirements)
25. Scraper:
    a. Carbon 1"
    b. Gasket 1"
26. Screwdriver - Blade Type:
    a. Stubby
    b. 6", 9", 12"
    c. Offset
27. Screwdriver - Phillips:
    a. Stubby #1, #2
    b. 6" #1, #2
    c. 12" #3
    d. Offset #2
28. Screwdriver - Impact Driver Set
29. Screw Starter:
    a. Phillips
    b. Standard
30. Socket Set - 1/4" Drive:
    a. 1/4" - 1/2" Standard Depth
    b. 1/4" - 1/2" Deep
    c. 6mm - 12mm Standard Depth
    d. 6mm - 12mm Deep
    e. Flex/Universal Type
    f. 3", 6" Extensions
    g. Ratchet
31. Socket Set - 3/8" Drive:
    a. 5/16" - 3/4" Standard Depth (6 point)
    b. 3/8" - 3/4" Deep (6 point)
    c. 10mm - 19mm Standard Depth
    d. 10mm - 19mm Deep
    e. 3", 5", 10" Extensions
    f. Flexhead Ratchet
    g. Ratchet
    h. Spark Plug Sockets 5/8", 13/16"
    i. Speed Handle
    j. Universal Joint
    k. Flexible Socket Set 3/8" - 3/4"
    l. Flexible Socket Set 10mm - 19mm
32. Socket Set - 1/2" Drive:
    a. 7/16" - 1 1/8" Standard Depth
    b. 7/16" - 1 1/8" Deep
    c. 10mm - 24mm Standard Depth
    d. 10mm - 24mm Deep
    e. 3", 6", 12" Extensions
    f. Flex Handle (Breaker Bar)
    g. Ratchet
33. Spark Plug Feeler Gauge (Gap Tool)
34. Tape Measure – Standard and Metric
35. Test Light (12V and self-powered)

36. Tire Pressure Gauge
37. Tire Tread Depth Gauge
38. Torque Wrench:
    a. 3/8" Drive (10 - 250 lb. in.)
    b. 3/8" Drive (5 - 75 lb. ft.)
    c. 1/2" Drive (50 - 250 lb. ft.)
39. Torx Set (screwdrivers and/or sockets):
    a. T-8 to T-60
40. Wire Brush

Appendix B: General Lab/Shop Equipment

The tools and equipment on this list are used in general lab/shop work but are not generally considered to be individually owned hand tools. A well-equipped, accredited program should have all of these general tools and equipment readily available and in sufficient quantity to provide quality instruction.

1. Air Chisel Set (various bits)
2. Air Compressor and Hoses
3. Air Pressure Regulator
4. Air Ratchet (3/8" drive)
5. Automotive Stethoscope (electronic recommended)
6. Axle Stands (Jack Stands)
7. Axle Support Stands (Screw Jacks)
8. Battery Charger
9. Battery/Starter/Charging System Tester
10. Bearing Packer (hand operated)
11. Belt Tension Gauge
12. Bench or Pedestal Grinder
13. Coolant/Combustion Gas Detector (recommended)
14. Coolant Tester
15. Cooling System Pressure Tester and Adapters
16. Creeper
17. Cylinder Leakage Tester
18. Dial Indicator with Flex Arm and Clamp Base
19. Digital Multimeter (DMM) with various lead sets (sufficient quantities to meet instruction goals)
20. Drain Pans
21. Drill - 3/8" variable speed, reversible
22. Drill - 1/2" variable speed, reversible
23. Electric Heat Gun
24. Engine Coolant Recovery Equipment or Recycler or Coolant Disposal Contract Service
25. Extension Cords
26. Face Shields
27. Fender Covers
28. Floor Jack (1½ Ton Minimum)
29. Hand Held Vacuum Pump
30. Hoist(s)
31. Hood Prop
32. Hydraulic Press with adapters
33. Impact Socket Sets - 3/8" Drive (Standard and Metric)
34. Impact Sockets - 1/2" Drive (7/16" - 1 1/8")
35. Impact Sockets - 1/2" Drive (12mm – 24mm)
36. Impact Sockets – 1/2" Drive Deep (30 mm, 32 mm, 36mm)
37. Impact Wrench - 1/2" Drive 146 7/1/2013 Impact Wrench - 3/8" Drive
38. Jumper Cables
39. Master Puller Set
40. Micrometer (Depth)
41. Micrometers - 0-1", 1-2", 2-3", 3-4", 4-5" (Outside Type)
42. Oil Can - Pump Type
43. Oil Filter Wrench and Sockets
44. Oxy-Acetylene Torch Set
45. Parts Cleaning Tank and Gloves (non-solvent based cleanser suggested)
46. Remote Starter Switch
47. Scan Tool OBDII w/CAN capability or Personal Computer (PC) with equivalent
48. interface (appropriate capability to support tasks taught)
49. Screw Extractor Set

50. Seat Covers
51. Serpentine Belt Tensioner Tools
52. Snap Ring Pliers Set - external
53. Snap Ring Pliers Set - internal
54. Soldering Gun
55. Soldering Iron (Pencil Tip)
56. Spark Plug Boot Puller
57. Tap and Die Set - Standard
58. Tap and Die Set – Metric
59. Temperature Sensing Device
60. Thread Repair Insert Kit
61. Tire Inflator Chuck
62. Trouble/Work Lights (Non-incandescent)
63. Tube Quick Disconnect Tool Set
64. Tubing Bender
65. Tubing Cutter/Flaring Set (Double-lap and ISO)
66. Twist Drill Set - 1/64" - 1/2"
67. Ultra Violet Leak Detection Device (Black Light)
68. Used Oil Receptacle with extension neck and funnel
69. Valve Core Removing Tool
70. Vernier Calipers
    a 0 - 6"
    b. 0 - 125mm
71. Wheel Chocks
72. Workbenches with vises

Appendix C: Specialty Tools and Equipment Within Each Accreditation Category

This section covers the tools and equipment a lab/shop should have for training in any given specialty area. This equipment is specialized and it must be available in the lab/shop or to the program. No specific type or brand names are identified because they will vary in each local situation.

For all tasks which are taught in the program, the training should be as thorough as possible with the tools and equipment necessary for those tasks. In other words, if a program does not teach a particular task, the tool from the tool list associated with that task is not required.

1. Brake Pedal Depressor
2. Hand Grease Gun
3. Shock Absorber Tool
4. Spring Compressor Tool
5. Tire Mounting Machine (rim clamp type)
6. Tire Pressure Monitoring System Tool (TPMS) as appropriate
7. Tire Patching Tools and Supplies
8. Wheel Balancer-Electronic Type
9. Wheel Weight Pliers
10. Compression Tester
11. Cylinder Power Balance Tester (scan tool/manual method)
12. Infrared Thermometer (or appropriate substitute)
13. Vacuum/ Pressure Gauge
14. Connector Pick Took Set
15. Molding and Trim Removal Tool (s)
16. Headlight Aimer or Screen
17. Heat gun (or equivalent for heat shrinking operations)
18. Wire and Terminal Repair Kit
19. Bearing Seal and Race Driver Set
20. Brake Bleeder (Pressure or Vacuum)
21. Brake Disc Micrometer and Calibration Equipment
22. Brake Fluid Test Strips or Kit
23. Brake Lathe (bench with disc and drum service attachments)
24. Brake Lathe (on car)
25. Brake shoe adjusting gauge
26. Brake spring remover/installer
27. Brake spring Pliers
28. Brake Spoon
29. Piston Retraction Set
30. Wheel Stud Service Kit
31. Axle Nut Socket Set (or equivalent)
32. Spindle Rethreaded Die Set
33. Universal Joint Tools
34. Antifreeze/Coolant Tester
35. Ball Joint Press and other Special Tools
36. Brake Pedal Depressor
37. Bushing Driver Set
38. Coil Spring Compressor Tool
39. Chassis Ear (recommended)
40. Frame Angle Gauge or Portable Digital Protractor (appropriate for tasks being taught)
41. Hand Grease Gun
42. Inner Tie Rod End Tool
43. Pitman Arm Puller
44. Power Steering Pump Pulley Special Tool Set (appropriate for tasks being taught)

45. Shock Absorber Tools
46. Steering Angle Gauge or Portable Digital Protractor (appropriate for tasks being taught
47. Strut Spring Compressor Tool
48. Tie Rod Puller
49. Tire Mounting Machine
50. Tire Patching Tools and Supplies
51. Tire Pressure Monitoring System (TPMS) Tool (appropriate for tasks being taught)
52. Wheel Alignment Equipment-4 wheel (including alignment tools)
53. Wheel Balancer - Electronic Type
54. Transmission Jack(s
55. Transmission/Transaxle Flushing Equipment (recommended)
56. Transmission/Transaxle Holding Fixtures
57. Transmission/Transaxle Removal and Installation Equipment
58. Transmission/Transaxle Special Tool Sets (appropriate for units being utilized)
59. Bearing Seal and Race Driver Set
60. Brake Bleeder (Pressure or Vacuum)
61. Brake Disc Micrometer
62. Brake Drum Micrometer and Calibration Equipment
63. Brake Fluid Test Strips or Kit
64. Brake Lathe (bench with disc and drum service attachments)
65. Brake Lathe (on car)
66. Brake Shoe Adjusting Gauge
67. Brake Spring Remover/Installer
68. Brake Spring Pliers
69. Brake Spoon
70. Caliper Piston Retraction Set
71. Master Cylinder Bleeder Kit
72. Wheel Stud Service Kit
73. ELECTRICAL/ELECTRONIC SYSTEMS
74. Connector Pick Tool Set
75. Molding and Trim Tool(s)
76. Headlight Aimer or Screen
77. Heat Gun (or equivalent for heat shrinking operations)
78. Terminal Tension (Pin Drag) Test Kit/Terminal Probe Kit (or equivalent)
79. Wire and Terminal Repair Kit
80. A/C Compressor Clutch Service Tools
81. A/C Service Port Adapter Set
82. Dye Injection Kit
83. Hygrometer
84. A/C Leak Detector (to meet current industry standard)
85. A/C Manifold Gauge Set or equivalent
86. (to meet current industry standard)
87. A/C Refrigerant Recovery/Recycling/Recharging Station (to meet current industry standard)
88. Thermometer(s) (digital)
89. A/C Sealant Detector Kit
90. Axle Nut Socket Set (or equivalent)
91. Clutch Alignment Set
92. Clutch Pilot Bearing/Bushing Puller/Installer
93. Constant Velocity Joint (CV) Service Tools:
94. Boot Installation Tool
95. Boot Clamp Pliers or Crimping Ring
96. Engine Support Fixture
97. Rotating Torque Wrench (beam-type or equivalent)
98. Universal Joint Tools
99. Spindle Rethreader Die Set

100. Cylinder Power Balance Tester (Scan Tool/Manual Method) 101.Evaporative Emissions Control System (EVAP)
102.Fuel Injection Pressure Gauge Sets with Adapters 103.Infrared Thermometer (or appropriate substitute) 104.Injector Pulse Tester
105. Leak Detector (Smoke or Nitrogen)
106. Logic Probe (suggested)
107. Oxygen Sensor Socket
108.Pinch-off Pliers
109.Sending Unit Socket(s)
110.Spark Plug Thread Tap
111.Spark Tester
112.Vacuum/Pressure Gauge
113.Antifreeze/Coolant Tester 114.Oil Pressure Gauge 115.Straight Edge
116.Torque Angle Gauge

Appendix D: Recommended Instructional Aid

It is recommended that instructors have access to the following items:

1. Cart, AV (for overhead projector) (1)
2. Cart, AV (for TV-VCR/DVD) (1)
3. Computer with operating software with multimedia kit (1)
4. Projector, overhead (1)
5. TV(Flat screen) (1)
6. VCR/CD/DVD (1)
7. Digital camera (1)
8. Interactive display board(1)
9. Instructor's laptop computer (rugged design) (1)

Appendix E: Curriculum Definitions and Terms

- Course Abbreviation – A common abbreviation that will be used by all community and junior colleges in reporting students

- Classification – Courses may be classified as the following:
    - Career Certificate Required Course – A required course for all students completing a career certificate.
    - Technical Certificate Required Course – A required course for all students completing a technical certificate.
    - Technical Elective – Elective courses that are available for colleges to offer to students.

- Description – A short narrative that includes the major purpose(s) of the course

- Prerequisites – A listing of any courses that must be taken prior to or on enrollment in the course

- Corequisites – A listing of courses that may be taken while enrolled in the course

- Student Learning Outcomes – A listing of the student outcomes (major concepts and performances) that will enable students to demonstrate mastery of these competencies

The following guidelines were used in developing the program(s) in this document and should be considered in compiling and revising course syllabi and daily lesson plans at the local level:

- The content of the courses in this document reflects approximately 75% of the time allocated to each course. The remaining 25% of each course should be developed at the local district level and may reflect the following:
    - Additional competencies and objectives within the course related to topics not found in the state framework, including activities related to specific needs of industries in the community college district
    - Activities that develop a higher level of mastery on the existing competencies and suggested objectives
    - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed or revised
    - Activities that include integration of academic and career–technical skills and course work, school-to- work transition activities, and articulation of secondary and postsecondary career–technical programs
    - Individualized learning activities, including work-site learning activities, to better prepare individuals in the courses for their chosen occupational areas

- Sequencing of the course within a program is left to the discretion of the local college. Naturally, foundation courses related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other courses related to specific skill areas and related academics, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors. Programs that offer an Associate of Applied Science Degree must include all of the required Career Certificate courses, Technical Certificate courses AND a minimum of 15 semester hours of General Education Core Courses. The courses in the General Education Core may be spaced out over the entire length of the program so that students complete some academic and Career Technical courses each semester. Each community college specifies the actual courses that are required to meet the General Education Core Requirements for the Associate of Applied Science Degree at their college.

- In order to provide flexibility within the districts, individual courses within a framework may be

customized by doing the following:

- Adding new student learning outcomes to complement the existing competencies and suggested objectives in the program framework
- Revising or extending the student learning outcomes
- Adjusting the semester credit hours of a course to be up 1 hour or down 1 hour (after informing the Mississippi Community College Board [MCCB] of the change)

Appendix F: Course Crosswalk

Course Crosswalk
Automotive Technology
CIP 47.0604 Automotive Technology

Note: Courses that have been added or changed in the 2018 curriculum are highlighted.

Existing			Revised		
2011 MS Curriculum Framework			**2018 MS Curriculum Framework**		
Course Number	**Course Title**	**Hours**	**Course Number**	**Course Title**	**Hours**
ATT 1124	Basic Electrical/Electronic	4	ATT 1124	Basic Electrical/Electronic	4
ATT 1134	Advanced Electrical/Electronic Systems	4	ATT 1134	Advanced Electrical/Electronic Systems	4
ATT 1214	Brakes	4	ATT 1214	Brakes	4
ATT 1313	Manual Drive Trains/Transaxles	3	ATT 1313	Manual Drive Trains/Transaxles	3
ATT 1424	Engine Performance I	4	ATT 1424	Engine Performance I	4
ATT 1715	Engine Repair	5	ATT 1715	Engine Repair	5
ATT 1811	Introduction, Safety, and Employability skills	1	ATT 1811	Introduction, Safety, and Employability skills	1
			ATT 2112	Introduction to Light Duty Diesel Technology, Tools and Safety	2
			ATT 2125	Light Duty Diesel Engine Repair	5
			ATT 2214	Light Duty Diesel Engine Performance	4
			ATT 2224	Light Duty Diesel Electrical	4
ATT 2334	Steering and Suspension	4	ATT 2334	Steering and Suspension	4
ATT 2324	Automatic Transmissions/Transaxles	4	ATT 2324	Automatic Transmissions/Transaxles	4
ATT 2434	Engine Performance II	4	ATT 2434	Engine Performance II	4
ATT2444	Engine Performance III	4	ATT2444	Engine Performance III	4
ATT 2614	Heating & Air Conditioning	4	ATT 2614	Heating & Air Conditioning	4
			ATT 2714	Light Duty Hybrid/ Electrical Vehicle Systems	4
ATT 291 (1-6)	Special Problem I in Automotive Technology	1-6	ATT 291 (1-6)	Special Problem I in Automotive Technology	1-6
ATT 293 (1-6)	Special Problem II in Automotive Technology	1-6	ATT 293 (1-6)	Special Problem II in Automotive Technology	1-6
ATT 292 (1-6)	Supervised Work Experience in Automotive Technology	1-6	ATT 292 (1-6)	Supervised Work Experience in Automotive Technology	1-6

Appendix G: Course Crosswalk

Course Crosswalk
Automotive Technology
CIP 47.0604 Automotive Technology

Note: Courses that have been added or changed in the 2018 curriculum are highlighted.

Existing			Revised		
2018 MS Curriculum Framework			2024 MS Curriculum Framework		
Course Number	**Course Title**	**Hours**	**Course Number**	**Course Title**	**Hours**
ATT 1124	Basic Electrical/Electronic	4	ATT 1124	Basic Electrical/Electronic	4
ATT 1134	Advanced Electrical/Electronic Systems	4	ATT 1134	Advanced Electrical/Electronic Systems	4
ATT 1214	Brakes	4	ATT 1214	Brakes	4
ATT 1313	Manual Drive Trains/Transaxles	3	ATT 1313	Manual Drive Trains/Transaxles	3
ATT 1424	Engine Performance I	4	ATT 1424	Engine Performance I	4
ATT 1715	Engine Repair	5	ATT 1715	Engine Repair	5
ATT 1811	Introduction, Safety, and Employability skills	1	ATT 1811	Introduction, Safety, and Employability skills	1
ATT 2112	Introduction to Light Duty Diesel Technology, Tools and Safety	2	ATT 2112	Introduction to Light Duty Diesel Technology, Tools and Safety	2
ATT 2125	Light Duty Diesel Engine Repair	5	ATT 2125	Light Duty Diesel Engine Repair	5
ATT 2214	Light Duty Diesel Engine Performance	4	ATT 2214	Light Duty Diesel Engine Performance	4
ATT 2224	Light Duty Diesel Electrical	4	ATT 2224	Light Duty Diesel Electrical	4
ATT 2334	Steering and Suspension	4	ATT 2334	Steering and Suspension	4
ATT 2324	Automatic Transmissions/Transaxles	4	ATT 2324	Automatic Transmissions/Transaxles	4
ATT 2434	Engine Performance II	4	ATT 2434	Engine Performance II	4
ATT2444	Engine Performance III	4	ATT2444	Engine Performance III	4
ATT 2614	Heating & Air Conditioning	4	ATT 2614	Heating & Air Conditioning	4
ATT 2714	Light Duty Hybrid/ Electrical Vehicle Systems	4	ATT 2714	Light Duty Hybrid/ Electrical Vehicle Systems	4
ATT 291 (1-6)	Special Problem I in Automotive Technology	1-6	ATT 291 (1-6)	Special Problem I in Automotive Technology	1-6
ATT 293 (1-6)	Special Problem II in Automotive Technology	1-6	ATT 293 (1-6)	Special Problem II in Automotive Technology	1-6
ATT 292 (1-6)	Supervised Work Experience in Automotive Technology	1-6	ATT 292 (1-6)	Supervised Work Experience in Automotive Technology	1-6

Appendix H: Recommended Textbook List

RECOMMENDED AUTOMOTIVE TECHNOLOGY TEXTBOOK LISTS CIP: 47.0604- AUTOMOTIVE TECHNOLOGY		
Title	**Author**	**ISBN**
Fundamentals of Automotive Technology 2nd Edition	Kirk VanGelder	978-1-284-10995-5
Modern Automotive Technology 9th Edition	James E. Duffy	978-1-63126-375-0
Automotive Technology Principles, Diagnosis, and Service 5th Edition	James D. Harderman	978-0-13-399461-2
Automotive Technology	Erjavec, Thompson	13: 978-1-133-61231-5
Light Duty Diesel	Sean Bennett	13: 978-1-4354-8047-6
Fundamentals of Automotive Technology Principals and Practice	Kirk VanGelder	978-1-284-10995-5
Modern Automotive Technology 10th Edition	James E. Duffy	978-1-64564-688-4