Florida Department of Education
Curriculum Framework

Program Title: **Advanced Automotive Service Technology 2**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program – Career Preparatory	
Program Number	T600200
CIP Number	0647060414
Grade Level	30, 31
Standard Length	1600 hours
Teacher Certification	Refer to the **Program Structure** section
CTSO	SkillsUSA
SOC Codes (all applicable)	49-3023 – Automotive Service Technicians and Mechanics
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml
Basic Skills Level	Mathematics: 10 Language: 10 Reading: 10

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in the Transportation, Distribution and Logistics career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Transportation, Distribution and Logistics career cluster.

The content includes but is not limited to broad, transferable skills and stresses understanding and demonstration of the following elements of the Automotive industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of seven occupational completion points.

NOTE: It is recommended that students complete **OCP-A (Automotive Maintenance Technician) of Advanced Automotive Service Technology 1** and/or demonstrate mastery of the outcomes in **OCP-A (Automotive Maintenance Technician) of Advanced Automotive Service Technology 1** prior to enrolling in additional Advanced Automotive Service Technology courses. **The sequence of OCP's, after completing and/or demonstrating mastery of OCP-A (Automotive Maintenance Technician) of Advanced Automotive Service Technology 1, is at the discretion of the instructor.**

For institutions using this framework, the National Automotive Technicians Education Foundation (NATEF) highly recommends the Master Automotive Service Technology (MAST) program Certification/Accreditation. Florida Statute (F.S.) 1004.925 – Automotive service technology education programs; certification. – requires all automotive service technology education programs shall be industry certified in accordance with rules adopted by the State Board of Education.

Benchmarks identified with a designation of P-1, P-2, or P-3 are ASE tasks.

When offered at the postsecondary adult career and technical level, this program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3) (b), F.S.

To teach the course(s) listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length	SOC Code
A	AER0118	Advanced Engine Repair Technician	AUTO IND @7 %7 %G AUTO MECH @7 7G	200 hours	49-3023
B	AER0258	Advanced Automatic Transmission and Transaxle Technician		200 hours	49-3023
C	AER0275	Advanced Manual Drivetrain and Axle Technician		200 hours	49-3023
D	AER0459	Advanced Automotive Suspension and Steering Technician		200 hours	49-3023
E	AER0419	Advanced Automotive Brake System Technician		200 hours	49-3023
F	AER0173	Advanced Automotive Heating and Air Conditioning Technician		200 hours	49-3023
G	AER0506	Advanced Automotive Engine Performance Technician		400 hours	49-3023

National Standards

Industry or National Standards corresponding to the standards and/or benchmarks for the Advanced Automotive Service Technology program can be found using the following link: http://www.aseeducation.org/program-accreditation

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

After successfully completing this program, the student will be able to perform the following:

01.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems
02.0 Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.
03.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive.
04.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.
05.0 Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.
06.0 Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.
07.0 Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems.

Florida Department of Education
Student Performance Standards

Program Title: Advanced Automotive Service Technology 2
Career Certificate Program Number: T600200

Course Number: AER0018
Occupational Completion Point: A
Advanced Engine Repair Technician – 200 Hours – SOC Code 49-3023

Course Description:
The Advanced Engine Repair Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engine theory and repair, cylinder heads, valve trains, engine blocks, lubrication, and cooling systems.

Abbreviations:
ER = Engine Repair

For every task in Advanced Engine Repair Technician 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.

ER Task List:	
P-1 =	24
P-2 =	16
P-3 =	11
Total	51

CTE Standards and Benchmarks	Priority Number
01.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems.--The student will be able to:	
General: Engine Diagnosis; Removal and Reinstallation (R&R)	
01.01 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1
01.02 Research vehicle service information including fluid type, internal engine operation, vehicle service history, service precautions, and technical service bulletins.	P-1
01.03 Verify operation of the instrument panel engine warning indicators.	P-1
01.04 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
01.05 Install engine covers using gaskets, seals, and sealers as required.	P-1
01.06 Verify engine mechanical timing.	P-1
01.07 Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external	P-1

CTE Standards and Benchmarks		Priority Number
	threads and repair internal threads with thread insert.	
01.08	Inspect, remove and/or replace engine mounts.	P-2
01.09	Identify service precautions related to service of the internal combustion engine of a hybrid vehicle.	P-2
01.10	Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3
Cylinder Head and Valve Train Diagnosis and Repair		
01.11	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
01.12	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
01.13	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
01.14	Adjust valves (mechanical or hydraulic lifters).	P-1
01.15	Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.	P-1
01.16	Establish camshaft position sensor indexing.	P-1
01.17	Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
01.18	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
01.19	Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
01.20	Inspect valves and valve seats; determine needed action.	P-3
01.21	Check valve spring assembled height and valve stem height; determine needed action.	P-3
01.22	Inspect valve lifters; determine needed action.	P-2
01.23	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3
01.24	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair		
01.25	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1
01.26	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
01.27	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
01.28	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
01.29	Deglaze and clean cylinder walls.	P-2
01.30	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-3
01.31	Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-1
01.32	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
01.33	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
01.34	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
01.35	Determine piston-to-bore clearance.	P-2
01.36	Inspect, measure, and install piston rings.	P-2
01.37	Inspect auxiliary shaft(s) (balance, intermediate, idler, counterbalance and/or silencer); inspect shaft(s) and support bearings for damage and wear; determine needed action; reinstall and time.	P-2
01.38	Assemble engine block.	P-1
Lubrication and Cooling Systems Diagnosis and Repair		
01.39	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
01.40	Identify causes of engine overheating.	P-1
01.41	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
01.42	Inspect and/or test coolant; drain and recover coolant; flush and refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1
01.43	Inspect, remove, and replace water pump.	P-2
01.44	Remove and replace radiator.	P-2
01.45	Remove, inspect, and replace thermostat and gasket/seal.	P-1
01.46	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
01.47	Perform oil pressure tests; determine needed action.	P-1
01.48	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
01.49	Inspect auxiliary coolers; determine needed action.	P-3
01.50	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
01.51	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2

CTE Standards and Benchmarks	Priority Number
Manufacturer Specific Engine Repair Tasks	
01.52 Inspect and replace engine cooling and heater system hoses.	
01.53 Service product specific water pumps.	
01.54 Service product specific belt drive and tensioner systems.	
01.55 Service product specific engine systems.	
01.56 Diagnose engine noises and vibrations; determine necessary action.	
01.57 Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
01.58 Perform engine vacuum tests; determine necessary action.	
01.59 Service product specific cam drive systems.	
01.60 Perform product specific valve adjustments.	
01.61 Perform cylinder power balance tests; determine necessary action.	
01.62 Perform cylinder cranking and running compression tests; determine necessary action.	
01.63 Perform cylinder leakage tests; determine necessary action.	
01.64 Remove and replace piston pin; where applicable.	
01.65 Service product specific engines	
01.66 Perform product specific relearn procedure	

Florida Department of Education
Student Performance Standards

Course Number: AER0258
Occupational Completion Point: B
Advanced Automatic Transmission and Transaxle Technician – 200 Hours – SOC Code 49-3023

Course Description:
The Advanced Automatic Transmission and Transaxle Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study automatic transmission/transaxle diagnosis, service, and repair.

Abbreviations:
AT = Automatic Transmission/Transaxle

For every task in Advanced Automatic Transmission and Transaxle Technician 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.

AT Task List:	
P-1	**17**
P-2	**19**
P-3	**3**
Total	**39**

CTE Standards and Benchmarks		**Priority Number**
02.0	Explain and apply proficiently the diagnosis, service, repair and overhaul of automatic transmissions/transaxles.--The student will be able to:	
General: Transmission and Transaxle Diagnosis		
02.01	Identify and interpret transmission/transaxle concerns, differentiate between engine performance and transmission/transaxle concerns; determine needed action.	P-1
02.02	Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
02.03	Diagnose fluid loss and condition concerns; determine needed action.	P-1
02.04	Check fluid level in a transmission or a transaxle equipped with a dip-stick.	P-1
02.05	Check fluid level in a transmission or a transaxle not equipped with a dip-stick.	P-1
02.06	Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine needed action.	P-1
02.07	Diagnose noise and vibration concerns; determine needed action.	P-2
02.08	Perform stall test; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
02.09	Perform lock-up converter system tests; determine needed action.	P-3
02.10	Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.	P-1
02.11	Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.	P-1
02.12	Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).	P-2
In-Vehicle Transmission/Transaxle Maintenance Repair		
02.13	Inspect, adjust, and/or replace external manual valve shift linkage, transmission range sensor/switch, and/or park/neutral position switch.	P-1
02.14	Inspect for leakage; replace external seals, gaskets, and bushings.	P-2
02.15	Inspect, test, adjust, repair, and/or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses; demonstrate understanding of the relearn procedure.	P-1
02.16	Drain and replace fluid and filter(s); use proper fluid type per manufacturer specification.	P-1
02.17	Inspect, replace and align powertrain mounts.	P-2
Off-Vehicle Transmission and Transaxle Repair		
02.18	Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mounting surfaces.	P-2
02.19	Inspect, leak test, flush, and/or replace transmission/transaxle oil cooler, lines, and fittings.	P-1
02.20	Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.	P-2
02.21	Describe the operational characteristics of a continuously variable transmission (CVT).	P-3
02.22	Describe the operational characteristics of a hybrid vehicle drive train.	P-3
02.23	Disassemble, clean, and inspect transmission/transaxle.	P-1
02.24	Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, switches, solenoids, sleeves, retainers, brackets, check valves/balls, screens, spacers, and gaskets).	P-2
02.25	Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine needed action.	P-2
02.26	Assemble transmission/transaxle.	P-1
02.27	Inspect, measure, and reseal oil pump assembly and components.	P-2
02.28	Measure transmission/transaxle end play and/or preload; determine needed action.	P-1
02.29	Inspect, measure, and/or replace thrust washers and bearings.	P-2
02.30	Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valves/balls.	P-2

CTE Standards and Benchmarks		Priority Number
02.31	Inspect bushings; determine needed action.	P-2
02.32	Inspect and measure planetary gear assembly components; determine needed action.	P-2
02.33	Inspect case bores, passages, bushings, vents, and mating surfaces; determine needed action.	P-2
02.34	Diagnose and inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings; perform needed action.	P-2
02.35	Inspect measure, repair, adjust or replace transaxle final drive components.	P-2
02.36	Inspect clutch drum, piston, check-balls, springs, retainers, seals, friction plates, pressure plates, and bands; determine needed action.	P-2
02.37	Measure clutch pack clearance; determine needed action.	P-1
02.38	Air test operation of clutch and servo assemblies.	P-1
02.39	Inspect one-way clutches, races, rollers, sprags, springs, cages, retainers; determine needed action.	P-2
Manufacturer Specific Automatic Transmission Tasks		
02.40	Install and seat torque converter to engage drive/splines.	
02.41	Inspect bands and drums; determine necessary action.	
02.42	Service product specific automatic transmissions/transaxles.	
02.43	Perform product specific relearn procedure.	
02.44	Diagnose electronic transmission control systems using appropriate test equipment, service information, technical service bulletins, and schematics; diagnose shorts, grounds, opens, and resistance problems in electrical/electronic circuits; determine necessary action.	
02.45	Differentiate between engine performance, or other vehicle systems, and transmission/transaxle related problems; determine necessary action.	
02.46	Diagnose shift quality concerns resulting from problems in the electronic transmission control system; determine necessary action.	

Florida Department of Education
Student Performance Standards

Course Number: AER0275
Occupational Completion Point: C
Advanced Manual Drivetrain and Axle Technician – 200 Hours – SOC Code 49-3023

Course Description:
The Advanced Manual Drivetrain and Axle Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study manual drivetrain, clutch, transmission/transaxle, drive and half-shaft universals, constant velocity joints, rear axle differential, limited slip, four-wheel drive, all-wheel drive operation, assembly, diagnosis, service and repair.

Abbreviations:
MD = Manual Drivetrain and Axles

For every task in Advanced Manual Drivetrain and Axle Technician 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.

MD Task List:	
P-1 =	18
P-2 =	16
P-3 =	16
Total	50

CTE Standards and Benchmarks	Priority Number
03.0 Explain and apply proficiently the operation, assembly, diagnosis, service and repair of manual drivetrains, clutches, transmissions/transaxles, drive and half-shaft universals, constant velocity joints, rear axle differential assembly, limited slip, four-wheel drive and all-wheel drive.--The student will be able to:	
General: Drive Train Diagnosis	
03.01 Identify and interpret drive train concerns; determine needed action.	P-1
03.02 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
03.03 Check fluid condition; check for leaks; determine needed action.	P-1
03.04 Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification.	P-1
Clutch Diagnosis and Repair	
03.05 Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action.	P-1
03.06 Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and	P-1

CTE Standards and Benchmarks		Priority Number
	springs; perform needed action.	
03.07	Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable).	P-1
03.08	Bleed clutch hydraulic system.	P-1
03.09	Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification.	P-1
03.10	Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action.	P-1
03.11	Measure flywheel runout and crankshaft end play; determine needed action.	P-2
03.12	Describe the operation and service of a system that uses a dual mass flywheel.	P-3
Transmission/Transaxle Diagnosis and Repair		
03.13	Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers.	P-2
03.14	Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.	P-2
03.15	Diagnose noise concerns through the application of transmission/transaxle power-flow principles.	P-2
03.16	Diagnose hard shifting and jumping out of gear concerns; determine needed action.	P-2
03.17	Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action.	P-3
03.18	Disassemble, inspect clean, and reassemble internal transmission/transaxle components.	P-2
Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair (Front, Rear, All-Wheel, and Four-Wheel drive)		
03.19	Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action.	P-1
03.20	Diagnose universal joint noise and vibration concerns; perform needed action.	P-2
03.21	Inspect, remove, and/or replace bearings, hubs, and seals.	P-1
03.22	Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints.	P-1
03.23	Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.	P-2
Drive Axle Diagnosis and Repair – Ring and Pinion Gears and Differential Case Assembly		
03.24	Clean and inspect differential case; check for leaks; inspect housing vent.	P-1
03.25	Check and adjust differential case fluid level; use proper fluid type per manufacturer specifications.	P-1
03.26	Drain and refill differential case; use proper fluid type per manufacturer specifications.	P-1
03.27	Diagnose noise and vibration concerns; determine needed action.	P-2
03.28	Inspect and replace companion flange and/or pinion seal; measure companion flange runout.	P-2
03.29	Inspect ring gear and measure runout; determine needed action.	P-3

CTE Standards and Benchmarks	Priority Number
03.30 Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings.	P-3
03.31 Measure and adjust drive pinion depth.	P-3
03.32 Measure and adjust drive pinion bearing preload.	P-3
03.33 Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).	P-3
03.34 Check ring and pinion tooth contact patterns; perform needed action.	P-3
03.35 Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.	P-3
03.36 Reassemble and reinstall differential case assembly; measure runout; determine needed action.	P-3
Drive Axle Diagnosis and Repair – Limited Slip Differential	
03.37 Diagnose noise, slippage, and chatter concerns; determine needed action.	P-3
03.38 Measure rotating torque; determine needed action.	P-3
Drive Axle Diagnosis and Repair – Drive Axles	
03.39 Inspect and replace drive axle wheel studs.	P-1
03.40 Remove and replace drive axle shafts.	P-1
03.41 Inspect and replace drive axle shaft seals, bearings, and retainers.	P-2
03.42 Measure drive axle flange runout and shaft end play; determine needed action.	P-2
03.43 Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action.	P-2
Four-Wheel Drive/All-Wheel Drive Component Diagnosis and Repair	
03.44 Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.	P-3
03.45 Inspect locking hubs; determine needed action.	P-3
03.46 Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.	P-3
03.47 Identify concerns related to variations in tire circumference and/or final drive ratios.	P-2
03.48 Diagnose noise, vibration, and unusual steering concerns; determine needed action.	P-3
03.49 Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems.	P-2
03.50 Disassemble, service, and reassemble transfer case and components.	P-2
Manufacturer Specific Manual Drivetrain and Axle Tasks	

CTE Standards and Benchmarks		Priority Number
03.51	Locate and interpret vehicle major drivetrain components and identification numbers.	
03.52	Diagnose fluid loss, level, and condition concerns; determine necessary action.	
03.53	Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action.	
03.54	Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action.	
03.55	Remove and reinstall manual transmission/transaxle.	
03.56	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action.	
03.57	Inspect, replace, and align powertrain mounts.	
03.58	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.	
03.59	Remove and replace transaxle final drive.	
03.60	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.	
03.61	Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action.	
03.62	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.	
03.63	Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.	
03.64	Inspect lubrication devices (oil pump or slingers); perform necessary action.	
03.65	Inspect, test, and replace transmission/transaxle sensors and switches.	
03.66	Inspect, service, and replace shaft center support bearings.	
03.67	Diagnose noise and vibration concerns; determine necessary action.	
03.68	Inspect and reinstall limited slip differential components.	
03.69	Remove and reinstall transfer case.	
03.70	Service product specific clutch assembly	
03.71	Service product specific manual transmission/transaxles	
03.72	Service product specific driveaxles/driveshafts	
03.73	Service product specific transfer cases	

Florida Department of Education
Student Performance Standards

Course Number: AER0459
Occupational Completion Point: D
Advanced Automotive Suspension and Steering Technician – 200 Hours – SOC Code 49-3023

Course Description:
The Advanced Automotive Suspension and Steering Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study front and rear suspension systems, wheel alignment, wheels and tire, diagnosis, service, and repair.

Abbreviations:
SS = Suspension and Steering

For every task in Advanced Automotive Suspension and Steering Technician 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.

SS Task List:	
	P-1 = 27
	P-2 = 20
	P-3 = 10
Total	**57**

CTE Standards and Benchmarks	**Priority Number**
04.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.--The student will be able to:	
General: Suspension and Steering Systems	
04.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
04.02 Identify and interpret suspension and steering system concerns; determine needed action.	P-1
Steering Systems Diagnosis and Repair	
04.03 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
04.04 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
04.05 Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2
04.06 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
04.07 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
04.08	Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2
04.09	Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
04.10	Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
04.11	Inspect power steering fluid level and condition.	P-1
04.12	Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2
04.13	Inspect for power steering fluid leakage; determine needed action.	P-1
04.14	Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1
04.15	Remove and reinstall power steering pump.	P-2
04.16	Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2
04.17	Inspect, remove and/or replace power steering hoses and fittings.	P-2
04.18	Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
04.19	Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
04.20	Inspect, test and diagnose electrically- assisted power steering systems (including using a scan tool); determine needed action.	P-2
04.21	Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2
04.22	Test power steering system pressure; determine needed action.	P-2
Suspension Systems Diagnosis and Repair		
04.23	Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
04.24	Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
04.25	Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3
04.26	Inspect, remove, and/or replace strut rods and bushings.	P-3
04.27	Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
04.28	Inspect, remove, and/or replace steering knuckle assemblies.	P-3
04.29	Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3
04.30	Inspect, remove, and/or replace torsion bars and mounts	P-3
04.31	Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3

CTE Standards and Benchmarks		Priority Number
04.32	Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
04.33	Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3
04.34	Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.	P-1
Related Suspension and Steering Service		
04.35	Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1
04.36	Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
04.37	Describe the function of suspension and steering control systems and components, (i.e. active suspension and stability control).	P-3
Wheel Alignment Diagnosis, Adjustment, and Repair		
04.38	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action.	P-1
04.39	Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
04.40	Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel.	P-1
04.41	Check toe-out-on-turns (turning radius); determine needed action.	P-2
04.42	Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
04.43	Check rear wheel thrust angle; determine needed action.	P-1
04.44	Check for front wheel setback; determine needed action.	P-2
04.45	Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
04.46	Reset steering angle sensor.	P-2
Wheels and Tires Diagnosis and Repair		
04.47	Inspect tire condition; identify tire wear patterns; check for correct tire size, application (load and speed ratings), and air pressure as listed on the tire information placard/label.	P-1
04.48	Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
04.49	Rotate tires according to manufacturer’s recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
04.50	Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
04.51	Diagnose tire pull problems; determine needed action.	P-1
04.52	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
04.53	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1

CTE Standards and Benchmarks		Priority Number
04.54	Inspect tire and wheel assembly for air loss; perform needed action.	P-1
04.55	Repair tire following vehicle manufacturer approved procedure.	P-1
04.56	Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
04.57	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
Manufacturer Specific Steering and Suspension Tasks		
04.58	Service product specific suspension systems.	
04.59	Service product specific ride height control systems.	
04.60	Locate and interpret vehicle major suspension components and identification numbers.	
04.61	Adjust non-rack and pinion worm bearing preload and sector lash.	
04.62	Reinstall wheel; torque lug nuts.	
04.63	Service product specific tire pressure monitoring systems	
04.64	Service product specific electric power steering systems	
04.65	Reset product specific steering wheel sensors	
04.66	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the steering and suspension control systems; determine necessary action.	
04.67	Perform multiplex check to determine that all steering and suspension components are communicating and are performing within specifications.	

Florida Department of Education
Student Performance Standards

Course Number: AER0419
Occupational Completion Point: E
Advanced Automotive Brake System Technician – 200 Hours – SOC Code 49-3023

Course Description:
The Advanced Automotive Brake System Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study drum/disc brakes, hydraulics, power assist units, electronic brakes, traction control, stability control, and miscellaneous diagnostics, service, and repair.

Abbreviations:
BR = Brakes

For every task in Advanced Automotive Brake System Technician 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.

BR Task List:	
P-1 =	40
P-2 =	11
P-3 =	5
Total	56

CTE Standards and Benchmarks	Priority Number
05.0 Explain and apply proficiently the diagnosis, service and repair of drum\disc brake, hydraulics, power assist units, electronic brakes, traction control, stability control systems and miscellaneous (wheel bearings, parking brake, electrical, etc.) systems.--The student will be able to:	
General: Brake Systems Diagnosis	
05.01 Identify and interpret brake system concerns; determine needed action.	P-1
05.02 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
05.03 Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS).	P-1
05.04 Install wheel and torque lug nuts.	P-1
Hydraulic System Diagnosis and Repair	
05.05 Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
05.06 Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
05.07	Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1
05.08	Remove, bench bleed, and reinstall master cylinder.	P-1
05.09	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
05.10	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
05.11	Replace brake lines, hoses, fittings, and supports.	P-2
05.12	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
05.13	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
05.14	Inspect, test, and/or replace components of brake warning light system.	P-3
05.15	Identify components of hydraulic brake warning light system.	P-2
05.16	Bleed and/or flush brake system.	P-1
05.17	Test brake fluid for contamination.	P-1
Drum Brake Diagnosis and Repair		
05.18	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-1
05.19	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-1
05.20	Refinish brake drum and measure final drum diameter; compare with specification.	P-1
05.21	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-1
05.22	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
05.23	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-1
Disc Brake Diagnosis and Repair		
05.24	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
05.25	Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
05.26	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
05.27	Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
05.28	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
05.29	Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
05.30	Remove and reinstall/replace rotor.	P-1
05.31	Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
05.32	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-1
05.33	Retract and re-adjust caliper piston on an integrated parking brake system.	P-2
05.34	Check brake pad wear indicator; determine needed action.	P-1
05.35	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1
Power-Assist Units Diagnosis and Repair		
05.36	Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
05.37	Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum- type power booster.	P-1
05.38	Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action.	P-1
05.39	Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.	P-3
05.40	Measure and adjust master cylinder pushrod length.	P-3
Related Systems (i.e. Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair		
05.41	Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
05.42	Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2
05.43	Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed.	P-1
05.44	Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
05.45	Check operation of brake stop light system.	P-1
05.46	Replace wheel bearing and race.	P-3
05.47	Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
05.48	Inspect and replace wheel studs.	P-1
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair		
05.49	Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action.	P-1
05.50	Describe the operation of a regenerative braking system.	P-3
05.51	Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action.	P-2

CTE Standards and Benchmarks		Priority Number
05.52	Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action.	P-2
05.53	Depressurize high-pressure components of an electronic brake control system.	P-2
05.54	Bleed the electronic brake control system hydraulic circuits.	P-1
05.55	Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).	P-2
05.56	8. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-1
Manufacturer Specific Brake, Traction Control and Vehicle Stability Control Tasks		
05.57	Service product specific anti-lock brake systems	
05.58	Service product specific traction control systems.	
05.59	Locate and interpret vehicle major brake component and identification numbers (VIN, vehicle certification labels, calibration decals).	
05.60	Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	
05.61	Install wheel, torque lug nuts, and make final checks and adjustments associated with drum brakes.	
05.62	Install wheel, torque lug nuts, and make final checks and adjustments associated with disc brakes.	
05.63	Remove and install electronic brake control system electrical/electronic and hydraulic components.	
05.64	Service product specific braking systems.	
05.65	Perform product specific brakes relearn procedures	
05.66	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the brake, traction control and vehicle stability control systems; determine necessary action.	
05.67	Perform multiplex check to determine that all brake, traction control and vehicle stability control components are communicating and are performing within specifications.	

Florida Department of Education
Student Performance Standards

Course Number: AER0173
Occupational Completion Point: F
Advanced Automotive Heating and Air Conditioning Technician – 200 Hours – SOC Code 49-3023

Course Description:
The Advanced Automotive Heating and Air Conditioning Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, recycling and handling, diagnostics, service, and repair.

Abbreviations:
HA = Heating and Air Conditioning

For every task in Advanced Automotive Heating and Air Conditioning Technician 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.

HA Task List:	
P-1 =	16
P-2 =	16
P-3 =	4
Total	36

CTE Standards and Benchmarks		Priority Number
06.0	Explain and apply proficiently the diagnosis, service and repair of heating and air conditioning, refrigeration, compressors, compressor clutches, evaporators, receiver driers, accumulators, condensers, heating and engine cooling, related control systems, refrigerant recovery, and recycling and handling.--The student will be able to:	
General: A/C System Diagnosis and Repair		
06.01	Identify and interpret heating and air conditioning problems; determine needed action.	P-1
06.02	Research vehicle service information including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.	P-1
06.03	Performance test A/C system; identify problems.	P-1
06.04	Identify abnormal operating noises in the A/C system; determine needed action.	P-2
06.05	Identify refrigerant type; select and connect proper gauge set/test equipment; record temperature and pressure readings.	P-1
06.06	Leak test A/C system; determine needed action.	P-1
06.07	Inspect condition of refrigerant oil removed from A/C system; determine needed action.	P-2

CTE Standards and Benchmarks	Priority Number
06.08 Determine recommended oil and oil capacity for system application.	P-1
06.09 Using a scan tool, observe and record related HVAC data and trouble codes.	P-3
Refrigeration System Component Diagnosis and Repair	
06.10 Inspect, remove, and/or replace A/C compressor drive belts, pulleys, tensioners and visually inspect A/C components for signs of leaks; determine needed action.	P-1
06.11 Inspect, test, service and/or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.	P-2
06.12 Remove, inspect, reinstall, and/or replace A/C compressor and mountings; determine recommended oil type and quantity.	P-2
06.13 Identify hybrid vehicle A/C system electrical circuits and service/safety precautions.	P-2
06.14 Determine need for an additional A/C system filter; perform needed action.	P-3
06.15 Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform needed action.	P-2
06.16 Inspect for proper A/C condenser airflow; determine needed action.	P-1
06.17 Remove, inspect, and replace receiver/drier or accumulator/drier; determine recommended oil type and quantity.	P-2
06.18 Remove, inspect, and install expansion valve or orifice (expansion) tube.	P-1
06.19 Inspect evaporator housing water drain; perform needed action.	P-1
06.20 Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and/or control module) to interrupt system operation; determine needed action.	P-2
06.21 Determine procedure to remove and reinstall evaporator; determine required oil type and quantity.	P-2
Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair	
06.22 Inspect engine cooling and heater systems hoses and pipes; perform needed action.	P-1
06.23 Inspect and test heater control valve(s); perform needed action.	P-2
06.24 Diagnose temperature control problems in the HVAC system; determine needed action.	P-2
06.25 Determine procedure to remove, inspect, reinstall, and/or replace heater core.	P-2
Operating Systems and Related Controls Diagnosis and Repair	
06.26 Inspect and test HVAC system blower motors, resistors, switches, relays, wiring, and protection devices; determine needed action.	P-1
06.27 Diagnose A/C compressor clutch control systems; determine needed action.	P-2
06.28 Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine needed action.	P-2

CTE Standards and Benchmarks	Priority Number
06.29 Inspect and test HVAC system control panel assembly; determine needed action.	P-3
06.30 Inspect and test HVAC system control cables, motors, and linkages; perform needed action.	P-3
06.31 Inspect HVAC system ducts, doors, hoses, cabin filters, and outlets; perform needed action.	P-1
06.32 Identify the source of HVAC system odors.	P-2
06.33 Check operation of automatic or semi-automatic HVAC control systems; determine needed action.	P-2
Refrigerant Recovery, Recycling, and Handling	
06.34 Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.	P-1
06.35 Identify A/C system refrigerant; test for sealants; recover, evacuate, and charge A/C system; add refrigerant oil as required.	P-1
06.36 Recycle, label, and store refrigerant.	P-1
Manufacturer Specific Heating and Air Conditioning Related Tasks	
06.37 Service product specific climate control systems.	
06.38 Locate and interpret vehicle heating and air conditioning major components and identification numbers.	
06.39 Perform cooling system pressure tests; check coolant condition, inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action.	
06.40 Inspect, test, and replace thermostat and gasket/seal.	
06.41 Determine coolant condition and coolant type for vehicle application; drain and recover coolant.	
06.42 Flush system; refill system with recommended coolant; bleed system.	
06.43 Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.	
06.44 Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.	
06.45 Service product specific hybrid heating and A/C systems.	
06.46 Perform product specific heating and A/C relearn procedure	
06.47 Interpret diagnostic trouble codes (DTCs) and scan tool data related to the Heating and Air Conditioning systems; determine necessary action.	
06.48 Perform multiplex check to determine that Heating and Air Conditioning components are communicating and are performing within specifications.	
06.49 Identify proper service precautions and procedures for R1234yf systems.	

Florida Department of Education
Student Performance Standards

Course Number: AER0506
Occupational Completion Point: G
Advanced Automotive Engine Performance Technician – 400 Hours – SOC Code 49-3023

Course Description:
The Advanced Automotive Engine Performance Technician course prepares students for entry into the Automotive Service industry. Content emphasizes beginning skills and concepts as a recommended requisite. Students study engines, ignition, fuel, air induction, exhaust, computer, engine and emission control systems diagnostics, service, and repair.

Abbreviations:
EP = Engine Performance

For every task in Advanced Automotive Engine Performance Technician 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.

EP Task List:	
P-1 =	21
P-2 =	20
P-3 =	2
Total	43

CTE Standards and Benchmarks		Priority Number
07.0	Explain and apply proficiently the diagnosis, service and repair of engines, ignition, fuel, air induction, exhaust, computer engine and emission control systems.--The student will be able to:	
General: Engine Diagnosis		
07.01	Identify and interpret engine performance concerns; determine needed action.	P-1
07.02	Research vehicle service information including vehicle service history, service precautions, and technical service bulletins.	P-1
07.03	Diagnose abnormal engine noises or vibration concerns; determine needed action.	P-3
07.04	Diagnose the cause of excessive oil consumption, coolant consumption, unusual exhaust color, odor, and sound; determine needed action.	P-2
07.05	Perform engine absolute manifold pressure tests (vacuum/boost); determine needed action.	P-1
07.06	Perform cylinder power balance test; determine needed action.	P-2
07.07	Perform cylinder cranking and running compression tests; determine needed action.	P-1
07.08	Perform cylinder leakage test; determine needed action.	P-1

CTE Standards and Benchmarks		Priority Number
07.09	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine needed action.	P-2
07.10	Verify engine operating temperature; determine needed action.	P-1
07.11	Verify correct camshaft timing including engines equipped with variable valve timing systems (VVT).	P-1
Computerized Controls Diagnosis and Repair		
07.12	Retrieve and record diagnostic trouble codes (DTC), OBD monitor status, and freeze frame data; clear codes when applicable.	P-1
07.13	Access and use service information to perform step-by-step (troubleshooting) diagnosis.	P-1
07.14	Perform active tests of actuators using a scan tool; determine needed action.	P-1
07.15	Describe the use of OBD monitors for repair verification.	P-1
07.16	Diagnose the causes of emissions or drive-ability concerns with stored or active diagnostic trouble codes (DTC); obtain, graph, and interpret scan tool data.	P-1
07.17	Diagnose emissions or drive-ability concerns without stored or active diagnostic trouble codes; determine needed action.	P-1
07.18	Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform needed action.	P-2
07.19	Diagnose drive-ability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, HVAC, automatic transmissions, non-OEM installed accessories, or similar systems); determine needed action.	P-2
Ignition System Diagnosis and Repair		
07.20	Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor drive-ability, spark knock, power loss, poor mileage, and emissions concerns; determine needed action.	P-2
07.21	Inspect and test crankshaft and camshaft position sensor(s); determine needed action.	P-1
07.22	Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram/initialize as needed.	P-3
07.23	Remove and replace spark plugs; inspect secondary ignition components for wear and damage.	P-1
Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair		
07.24	Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor drive-ability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine needed action.	P-2
07.25	Check fuel for contaminants; determine needed action.	P-2
07.26	Inspect and test fuel pump(s) and pump control system for pressure, regulation, and volume; perform needed action.	P-1
07.27	Replace fuel filter(s) where applicable.	P-2

CTE Standards and Benchmarks		Priority Number
07.28	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
07.29	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2
07.30	Inspect, test, and/or replace fuel injectors.	P-2
07.31	Verify idle control operation.	P-1
07.32	Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform needed action.	P-1
07.33	Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; determine needed action.	P-1
07.34	Perform exhaust system back-pressure test; determine needed action.	P-2
07.35	Check and refill diesel exhaust fluid (DEF).	P-2
07.36	Test the operation of turbocharger/supercharger systems; determine needed action.	P-2
Emissions Control Systems Diagnosis and Repair		
07.37	Diagnose oil leaks, emissions, and drive-ability concerns caused by the positive crankcase ventilation (PCV) system; determine needed action.	P-3
07.38	Inspect, test, service, and/or replace positive crankcase ventilation (PCV) filter/breather, valve, tubes, orifices, and hoses; perform needed action.	P-2
07.39	Diagnose emissions and drive-ability concerns caused by the exhaust gas recirculation (EGR) system; inspect, test, service and/or replace electrical/electronic sensors, controls, wiring, tubing, exhaust passages, vacuum/pressure controls, filters, and hoses of exhaust gas recirculation (EGR) systems; determine needed action.	P-2
07.40	Diagnose emissions and drive-ability concerns caused by the secondary air injection system; inspect, test, repair, and/or replace electrical/electronically-operated components and circuits of secondary air injection systems; determine needed action.	P-2
07.41	Diagnose emissions and drive-ability concerns caused by the evaporative emissions control (EVAP) system; determine needed action.	P-1
07.42	Diagnose emission and drive-ability concerns caused by catalytic converter system; determine needed action.	P-2
07.43	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine needed action.	P-2
Manufacturer Specific Engine Performance Related Tasks		
07.44	Adjust valves on engines with mechanical or hydraulic lifters.	
07.45	Remove and replace timing belt; verify correct camshaft timing.	
07.46	Remove and replace thermostat and gasket/seal.	

CTE Standards and Benchmarks		Priority Number
07.47	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	
07.48	Perform common fastener and thread repairs, to include: remove broken bolt, restore internal and external threads, and repair internal threads with a threaded insert.	
07.49	Inspect engine oil and/or filter for condition and determine necessary action.	
07.50	Identify hybrid vehicle internal combustion engine service precautions.	
07.51	Demonstrate proficiency in use of computer-based information systems.	
07.52	Perform product specific OBD II drive cycle diagnostic tests.	
07.53	Service product specific ignition systems.	
07.54	Inspect and test distributor; service as needed.	
07.55	Perform exhaust system back-pressure test; determine needed action.	
07.56	Service product specific fuel injection systems.	
07.57	Locate and interpret vehicle engine performance major components and identification numbers.	
07.58	Demonstrate knowledge of using a 4 or 5 gas analyzer, interpret readings, and determine necessary action.	
07.59	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	
07.60	Check for module communication (including CAN/BUS systems) errors using a scan tool.	
07.61	Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action.	
07.62	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	
07.63	Demonstrate knowledge of direct injection systems.	
07.64	Interpret diagnostic trouble codes (DTCs) and scan tool data related to the engine control systems; determine necessary action.	
07.65	Perform multiplex check to determine that engine control components are communicating and are performing within specifications.	
07.66	Perform universal drive cycle to run monitors and erase permanent DTCs.	

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Benchmarks identified with a designation of P-1, P-2, or P-3 are ASE tasks.

It is highly recommended that the program be NATEF Master Certified and be approved by the appropriate industry manufacturer to provide manufacturer certification. Instructors must meet the specific manufacturer certification and be A1-A8 ASE Master certified, Advanced Engine Performance (L1) ASE Certification is also recommended. Program must meet the equipment and specialty tool requirement as specified by the manufacturer sponsor. Program must offer EPA section 609 recognized refrigerant-recycling certification training.

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student. Access MyCareerShines by visiting: www.mycareershines.org.

Career and Technical Student Organization (CTSO)

SkillsUSA is the intercurricular career and technical student organization(s) providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In a Career Certificate Program offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Mathematics 10.0, Language 10.0, and Reading 10.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02(7), Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01(3)(a), F.S., may also be exempted from

meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91(3), F.S.

Students who possess a college degree at the Associate of Applied Science level or higher; who have completed or are exempt from the college entry-level examination; or who have passed a state, national, or industry licensure exam are exempt from meeting the Basic Skills requirement (Rule 6A-10.040, F.A.C.) Exemptions from state, national or industry licensure are limited to the certifications listed on the Basic Skills and Licensure Exemption List which may be accessed from the CTE Program Resources page.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Additional Resources

For additional information regarding articulation agreements, Bright Futures Scholarships, Fine Arts/Practical Arts Credit and Equivalent Mathematics and Equally Rigorous Science Courses please refer to:

http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml