Florida Department of Education
Curriculum Framework

Program Title: **Master Automotive Service Technology 1**
Program Type: **Career Preparatory**
Career Cluster: **Transportation, Distribution and Logistics**

Career Certificate Program		
Program Number	T400700	
CIP Number	0647060411	
Grade Level	30, 31	
Program Length	1050 hours	
Teacher Certification	Refer to the **Program Structure** section	
CTSO	SkillsUSA	
SOC Codes (all applicable)	For program SOC codes, please see the Program and Course Tables section of the CTE Program Resources page linked below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 10	Communications (Reading and Language Arts): 9

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 five occupational completion points.

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

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

When offered at the postsecondary 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
A	AER0014	Automobile Services Assistor	AUTO IND @7 %7 %G AUTO MECH @7 7G	300 hours
B	AER0418	Automotive Brake System Technician		150 hours
C	AER0453	Automobile Suspension and Steering Technician		150 hours
D	AER0360	Automotive Electrical/Electronic System Technician		300 hours
E	AER0110	Engine Repair Technician		150 hours

National Standards

Programs identified as having Industry or National Standards have been crosswalked with the corresponding standards and/or benchmarks. Industry or National Standards for the Master Automotive Service Technology 1 program can be found using the following link: https://www.aseeducationfoundation.org/program-accreditation

Florida's Career Readiness Skills for CTE Programs

Employability Skills	
01.0	Apply academic skills to workplace scenarios.
01.01	Use reading skills.
01.02	Use writing skills.
01.03	Use mathematical strategies and procedures.
01.04	Use scientific principles and procedures.
02.0	Design a solution to an industry problem.
02.01	Use critical thinking.
02.02	Use creativity.
02.03	Make sound decisions.
02.04	Solve problems.
02.05	Reason.
02.06	Plan and organize.
03.0	Manage resources within an industry project
03.01	Manage time.
03.02	Manage money or resources.
03.03	Manage materials.
03.04	Manage personnel.
04.0	Oversee the subcomponents, operations and output of a technical or organizational system.
04.01	Manage systems.
04.02	Monitor systems.
04.03	Improve systems.
05.0	Use information for decision making.
05.01	Locate information.
05.02	Organize information.
05.03	Use information.

	05.04 Analyze information.
	05.05 Communicate information.
06.0	Apply relevant technology to workplace scenarios to aid productivity.
	06.01 Use technology.
07.0	Interpret and express interpersonal communication.
	07.01 Communicate verbally.
	07.02 Listen actively.
	07.03 Comprehend written material.
	07.04 Convey information in writing.
	07.05 Communicate nonverbally.
	07.06 Interpret nonverbal communication.
08.0	Interact with others to accomplish workplace goals.
	08.01 Collaborate with others in a team.
	08.02 Respond to customer needs.
	08.03 Exercise leadership.
	08.04 Negotiate to resolve conflict.
	08.05 Respect others.
09.0	Manage personal behavior to maximize productivity and professional growth.
	09.01 Demonstrate responsibility and self-discipline.
	09.02 Adapt and show flexibility.
	09.03 Work independently.
	09.04 Demonstrate a willingness to learn.
	09.05 Demonstrate integrity.
	09.06 Demonstrate professionalism.
	09.07 Take initiative.
	09.08 Display positive attitude.
	09.09 Take responsibility for professional growth.

Job Attainment	
10.0	Find, assess and apply to job opportunities.
10.01	Identify online job posts relevant to his or her career aspirations.
10.02	Compare and contrast the job posts' required qualifications, job duties, compensation, benefits and employers.
10.03	Define what information, documentation and writing prompts are required for the positions.
11.0	Communicate personal competence, character and fit for a job opportunity.
11.01	Develop a resume.
11.02	Write a cover letter.
11.03	Curate a professional portfolio that includes work products.
11.04	Prepare for and experience a mock job interview.
12.0	Cultivate and leverage relationships to professionally advance.
12.01	Request a signed reference letter, letter of recommendation and/or an online skill/professionalism endorsement.
12.02	Develop a plan to cultivate a professional digital footprint.
12.03	Develop a networking plan for a specific industry of interest.

Standards

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

01.0 Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry.
02.0 Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive industry.
03.0 Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services.
04.0 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.
05.0 Explain and apply proficiently the diagnosis, service and repair of front and rear suspensions systems, wheel alignment, and wheels and tires.
06.0 Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.
07.0 Explain and apply proficiently the diagnosis, service and repair of engines, cylinder heads, valve train, engine block, lubrication and cooling systems.

Florida Department of Education
Student Performance Standards

Program Title: **Automotive Service Technology 1**
Career Certificate Program Number: **T400700**

Course Description: The Automotive Service Assistor course prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study equipment skills, safety regulations, routine maintenance, and customer service.

Abbreviations:
ASE = Supplemental Tasks

ER Task List	
P-1 =	12
P-2 =	6
P-3 =	0
Total	18

For every task in Automotive Services Assistor 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.

Course Number: AER0014 **Occupational Completion Point: A** **Automotive Services Assistor – 300 Hours**	**Priority Number**
01.0 Proficiently explain and apply required shop and personal safety tasks relating to the automotive industry. The student will be able to:	
01.01 Identify and apply general shop safety rules and procedures, EPA and OSHA standards.	ASE
01.02 Demonstrate knowledge of appropriate automotive industry certifications.	
01.03 Identify and define career opportunities in the automotive service industry.	
01.04 Research, identify, and interpret the Federal Law as recorded in (29 CFR-1910.1200).	
01.05 Identify appropriate emergency first aid procedures.	
01.06 Utilize and demonstrate safe procedures for handling of tools and equipment.	ASE
01.07 Identify and use proper placement of floor jacks and jack stands.	ASE
01.08 Identify and use proper procedures for safe lift operation.	ASE
01.09 Utilize proper ventilation procedures for working within the lab/shop area.	ASE
01.10 Identify proper procedures for safe pit usage.	

	01.11 Identify marked safety areas.	ASE
	01.12 Identify the location and the types of fire extinguishers and other fire safety equipment.	ASE
	01.13 Demonstrate knowledge of the procedures for using fire extinguishers and other safety equipment.	ASE
	01.14 Identify the location and use of eye wash stations.	ASE
	01.15 Identify the location of the posted evacuation routes.	ASE
	01.16 Comply with the required use of personal protection equipment (PPE) to include safety glasses, ear protection, gloves, shoes, and other devices as required during lab/shop activities.	ASE
	01.17 Identify and wear appropriate clothing for lab/shop activities.	ASE
	01.18 Secure hair and jewelry for lab/shop activities.	ASE
	01.19 Use proper handling procedures for automotive fluids.	
	01.20 Identify and describe typical automotive lubricants and lubricant properties.	
	01.21 Identify and describe typical automotive seals and gaskets.	
	01.22 Identify the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, battery electric vehicles, and hybrid electric vehicle high voltage circuits.	ASE
	01.23 Disable supplemental restraint systems (SRS) in accordance with manufacturers' procedures.	
	01.24 Identify the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)	ASE
	01.25 Locate and demonstrate knowledge of Safety Data Sheets (SDS).	ASE
02.0	Explain and apply required tasks associated with the proper use and handling of tools and equipment relating to the automotive industry. The student will be able to:	
	02.01 Identify tools and equipment and their appropriate usage in automotive applications.	ASE
	02.02 Identify and use standard and metric measurement skills and designation.	ASE
	02.03 Demonstrate proper cleaning, storage, and maintenance of tools and equipment.	ASE
	02.04 Demonstrate proper use of precision-measuring tools (i.e., micrometer, digital/dial-indicator, digital/dial caliper) and torque methods.	ASE
03.0	Demonstrate proficiency in preparing vehicle for routine pre/post maintenance and customer services. The student will be able to:	
	03.01 Identify information needed and the service requested on a repair order.	ASE
	03.02 Identify automobiles according to engine location, cylinders, type of drive system, purpose, etc.	
	03.03 Identify purpose and demonstrate proper use of fender covers, floor mats and other vehicle protection equipment.	ASE
	03.04 Demonstrate use of the three C's (Concern, Cause, and Correction).	ASE

03.05	Review vehicle service history.	ASE
03.06	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	ASE
03.07	Conduct an appropriate pre-service evaluation and report or note any concerns not already on the repair order.	
03.08	Determine the presence of a Tire Pressure Monitoring System (TPMS).	
03.09	Determine the presence of wheel locks.	
03.10	Determine the presence of an air suspension system.	
03.11	Check operation and status of instrument panel warning lights and gauges.	
03.12	Locate and use Vehicle Identification Number (VIN) vehicle information placards, decals, tags, as required.	
03.13	Demonstrate proficiency in manufacturer electronic service information system, including flat rate manuals, technical service bulletins and replacement part identification; where applicable.	
03.14	Use proper chemicals for cleaning and lubrication.	P-1
03.15	Reset maintenance indicators; as applicable.	
03.16	Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).	ASE
03.17	Inspect under-hood area for leaks, damage, and unusual conditions.	
03.18	Determine fluid type requirements and identify fluid.	P-1
03.19	Check engine oil level and condition; service as required.	
03.20	Check engine coolant level and condition; service as required.	
03.21	Check power steering fluid level and condition; service as required.	P-1
03.22	Check brake fluid level and condition; service as required.	
03.23	Check hydraulic clutch fluid and condition; service as required.	
03.24	Check windshield washer fluid level and condition; service as required.	
03.25	Check automatic transmission fluid level and condition; service as required.	
03.26	Inspect undercar area for leaks, damage, and unusual conditions.	
03.27	Check differential/transfer case fluid level; note unusual conditions; service as required.	P-2
03.28	Check manual transmission fluid level; note unusual conditions; service as required.	P-1
03.29	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear.	
03.30	Lubricate driveline, suspension and steering systems; as applicable.	

03.31	Inspect cooling system pipes and hoses for wear, damage, and proper routing.	
03.32	Change engine oil and filter.	P-1
03.33	Inspect, service, or replace air filters, filter housings, and intake duct work.	P-1
03.34	Inspect and replace fuel filters; as applicable.	P-2
03.35	Inspect and replace air filter.	
03.36	Inspect and replace cabin air filter.	
03.37	Inspect, replace and adjust drive belts; inspect tensioners and pulleys.	P-2
03.38	Document observed damage, unusual conditions, and concerns.	
03.39	Inspect struts, springs, and related components; service as required.	
03.40	Inspect stabilizer bar(s), bushings, brackets, and links; service as required.	
03.41	Inspect springs, torsion bars, and related components; service as required.	
03.42	Inspect shock absorbers and related components.	
03.43	Inspect constant velocity (CV) axle shaft boots; service as required.	
03.44	Identify service considerations when equipped with a Tire Pressure Monitoring System (TPMS).	
03.45	Identify nitrogen-filled tires.	
03.46	Inspect tires, diagnose tire wear patterns, inspect spare and mounting system; check and adjust tire pressure; where applicable.	
03.47	Dismount, inspect, and remount tire on wheel (with/without TPMS); balance wheel and tire assembly.	P-1
03.48	Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
03.49	Perform Road Force balance /match mounting.	P-2
03.50	Reinstall wheel; torque wheel fasteners to specification.	
03.51	Check wheel bearings for play and other signs of wear.	
03.52	Perform a visual inspection of a drum brake system.	
03.53	Perform a visual inspection of a disc brake system.	
03.54	Check operation of brake stop light system.	P-1
03.55	Check parking brake operation (manual/electric); check parking brake components for unusual conditions.	
03.56	Check wiper blades, inserts, and arms; replace wiper blades or inserts.	
03.57	Lubricate door latches and hinges.	

03.58	Inspect fuel tank, fuel cap and seal; inspect and replace fuel lines, fittings, and hoses; as applicable.	
03.59	Perform battery state-of-charge test; determine needed action.	P-1
03.60	Confirm proper battery capacity for vehicle application; perform battery capacity and load test; determine needed action.	P-1
03.61	Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed.	
03.62	Perform battery, starting, and charging system tests using appropriate tester.	
03.63	Start a vehicle using jumper cables or a battery auxiliary power supply (jump box).	
03.64	Maintain or restore electronic memory functions if required.	P-2
03.65	Inspect and test fusible links, circuit breakers, and fuses; confirm proper circuit operation; replace as needed.	
03.66	Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.	P-1
03.67	Aim headlights.	P-2

Course Description: The Automotive Brake System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of brake systems, drum brakes, disc brakes, power assist units, electronic brakes, traction, and stability control.

Abbreviations:
BR = Brakes

For every task in 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 = 30
	P-2 = 23
	P-3 = 3
Total	**56**

Course Number: AER0418 Occupational Completion Point: B Automotive Brake System Technician – 150 Hours		**Priority Number**
04.0	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		
04.01	Research vehicle service information such as fluid type, vehicle service history, service precautions,	P-1

	technical service bulletins, and recalls including vehicles equipped with advanced driver assistance systems (ADAS).	
04.02	Identify and interpret brake system concerns; determine needed action.	P-1
04.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
04.04	Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).	P-1
04.05	Install wheel and torque lug nuts.	P-1
04.06	Identify and interpret brake system concerns; determine needed action.	P-1
Hydraulic System Diagnosis and Repair		
04.07	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	P-1
04.08	Measure brake pedal height, travel, and free play (as applicable); determine needed action.	P-1
04.09	Check master cylinder for internal/external leaks and proper operation; determine needed action.	P-1
04.10	Remove, bench bleed, and reinstall master cylinder.	P-1
04.11	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.	P-1
04.12	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action.	P-1
04.13	Replace brake lines, hoses, fittings, and supports.	P-2
04.14	Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).	P-2
04.15	Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.	P-1
04.16	Inspect, test, and/or replace components of brake warning light system.	P-3
04.17	Identify components of hydraulic brake warning light system.	P-2
04.18	Bleed and/or replace brake fluid.	P-1
04.19	Test brake fluid for contamination.	P-1
04.20	Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.	
Drum Brake Diagnosis and Repair		
04.21	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.	P-2
04.22	Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.	P-2
04.23	Refinish brake drum and measure final drum diameter; compare with specification.	P-2

04.24	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
04.25	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.	P-2
04.26	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.	P-2
Disc Brake Diagnosis and Repair		
04.27	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	P-1
04.28	Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action.	P-1
04.29	Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action.	P-1
04.30	Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action.	P-1
04.31	Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks.	P-1
04.32	Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.	P-1
04.33	Remove and reinstall/replace rotor.	P-1
04.34	Refinish rotor on vehicle; measure final rotor thickness and compare with specification.	P-1
04.35	Refinish rotor off vehicle; measure final rotor thickness and compare with specification.	P-2
04.36	Retract and re-adjust caliper piston on an integrated parking brake system.	P-1
04.37	Check brake pad wear indicator; determine needed action.	
04.38	Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1
04.39	Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.	
Power-Assist Units Diagnosis and Repair		
04.40	Check brake pedal travel with and without engine running to verify proper power booster operation.	P-2
04.41	Identify components of the brake power assist system (vacuum, hydraulic, and electric).	P-2
04.42	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.	P-2
04.43	Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action.	P-2
04.44	Inspect electric power booster unit; determine needed action.	P-3
Related Systems (i.e., Wheel Bearings, Parking Brakes, Electrical) Diagnosis and Repair		

04.45	Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action.	P-1
04.46	Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.	P-2
04.47	Check parking brake operation (including electric parking brakes); check parking brake indicator light system operation; determine needed action.	P-2
04.48	Check parking brake operation and parking brake indicator light system operation; determine needed action.	P-1
04.49	Replace wheel bearing and race.	P-3
04.50	Remove, reinstall, and/or replace sealed wheel bearing assembly.	P-1
04.51	Inspect and replace wheel studs.	P-2
Electronic Brake Control Systems: Antilock Brake (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) Systems Diagnosis and Repair		
04.52	Identify and inspect electronic brake control system components (ABS, TCS, & ESC); determine needed action.	P-1
04.53	Describe the operation of a regenerative braking system.	P-2
04.54	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
04.55	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
04.56	Depressurize high-pressure components of an electronic brake control system.	P-2
04.57	Bleed the electronic brake control system hydraulic circuits.	P-1
04.58	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
04.59	Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).	P-2
04.60	Remove and install electronic brake control system electrical/electronic and hydraulic components.	

Course Description: The Automotive Suspension and Steering Technician prepare students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general suspension, steering systems, front suspensions, rear suspensions, wheel alignment, and tires.

Abbreviations:
SS = Suspension and Steering

For every task in Automotive Suspension and Steering Technician course, the following safety requirement MUST be strictly enforced:

SS Task List:
P-1 = 27
P-2 = 22
P-3 = 6
Total 55

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.

Course Number: AER0453 **Occupational Completion Point: C** **Automotive Suspension and Steering Technician – 150 Hours**	**Priority Number**
05.0 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	
05.01 Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins.	P-1
05.02 Identify and interpret suspension and steering system concerns; determine needed action.	P-1
Steering Systems Diagnosis and Repair	
05.03 Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.	P-1
05.04 Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).	P-1
05.05 Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.	P-2
05.06 Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
05.07 Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.	P-2
05.08 Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.	P-2
05.09 Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.	P-2
05.10 Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.	P-1
05.11 Inspect power steering fluid level and condition.	P-1
05.12 Flush, fill, and bleed power steering system; use proper fluid type per manufacturer specification.	P-2
05.13 Inspect for power steering fluid leakage; determine needed action.	P-1
05.14 Remove, inspect, replace, and/or adjust power steering pump drive belt.	P-1
05.15 Remove and reinstall power steering pump.	P-2
05.16 Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.	P-2

05.17 Inspect, remove and/or replace power steering hoses and fittings.	P-2
05.18 Inspect, remove and/or replace pitman arm, relay (center-link/intermediate) rod, idler arm, mountings, and steering linkage damper.	P-2
05.19 Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.	P-1
05.20 Inspect, test and diagnose electrically- assisted power steering systems (including using a scan tool); determine needed action.	P-2
05.21 Identify hybrid vehicle power steering system electrical circuits and safety precautions.	P-2
05.22 Test power steering system pressure; determine needed action.	P-2
Suspension Systems Diagnosis and Repair	
05.23 Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
05.24 Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.	P-1
05.25 Inspect, remove, and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.	P-3
05.26 Inspect, remove, and/or replace strut rods and bushings.	P-3
05.27 Inspect, remove, and/or replace upper and/or lower ball joints (with or without wear indicators).	P-2
05.28 Inspect, remove, and/or replace steering knuckle assemblies.	P-3
05.29 Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.	P-3
05.30 Inspect, remove, and/or replace torsion bars and mounts	P-3
05.31 Inspect, remove, and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.	P-3
05.32 Inspect, remove, and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.	P-3
05.33 Inspect, remove, and/or replace track bar, strut rods/radius arms, and related mounts and bushings.	P-3
05.34 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	
05.35 Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.	P-1
05.36 Remove, inspect, service and/or replace front and rear wheel bearings.	P-1
05.37 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	
05.38 Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering	P-1

	return concerns; determine needed action.	
05.39	Perform pre-alignment inspection; measure vehicle ride height; determine needed action.	P-1
05.40	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
05.41	Check toe-out-on-turns (turning radius); determine needed action.	P-2
05.42	Check steering axis inclination (SAI) and included angle; determine needed action.	P-2
05.43	Check rear wheel thrust angle; determine needed action.	P-1
05.44	Check for front wheel setback; determine needed action.	P-2
05.45	Check front and/or rear cradle (sub-frame) alignment; determine needed action.	P-3
05.46	Reset steering angle sensor and related equipment.	P-2
Wheels and Tires Diagnosis and Repair		
05.47	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
05.48	Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.	P-2
05.49	Rotate tires according to manufacturer's recommendation including vehicles equipped with tire pressure monitoring systems (TPMS)	P-1
05.50	Measure wheel, tire, axle flange, and hub runout; determine needed action.	P-2
05.51	Diagnose tire pull problems; determine needed action.	P-1
05.52	Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.	P-1
05.53	Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.	P-1
05.54	Inspect tire and wheel assembly for air loss; perform needed action.	P-1
05.55	Repair tire following vehicle manufacturer approved procedure.	P-1
05.56	Identify indirect and direct tire pressure monitoring system (TPMS); calibrate system; verify operation of instrument panel lamps.	P-1
05.57	Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS) including relearn procedure	P-1
05.58	Reinstall wheel; torque lug nuts.	

Course Description: The Automotive Electrical/Electronic System Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of electrical/electronics, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems.

Abbreviations:
EE = Electrical/Electronic Systems

For every task in Automotive Electrical/Electronic 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.

EE Task List:	
P-1 =	40
P-2 =	6
P-3 =	0
Total	46

Course Number: AER0360 Occupational Completion Point: D Automotive Electrical/Electronic System Technician – 300 Hours		Priority Number
06.0	Explain and apply proficiently the diagnosis, service and repair of electrical/electronic system components, battery, starting, charging, lighting, gauges, warning devices, driver information, horn, wiper/washer and accessory systems. The student will be able to:	
General: Electrical System Diagnosis		
06.01	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
06.02	Identify electrical/electronic system components and configurations.	P-1
06.03	Retrieve and record DTCs, OBD monitor status, and freeze frame data; clear codes and data when directed.	P-1
06.04	Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).	P-1
06.05	Demonstrate proper use of a digital multi-meter (DMM) when measuring source voltage, voltage drop (including grounds), current flow and resistance.	P-1
06.06	Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.	P-1
06.07	Describe types of test lights; use appropriate test light to check operation of electrical circuits per service information.	P-1
06.08	Use fused jumper wires to check operation of electrical circuits.	P-1
06.09	Use wiring diagrams during the diagnosis of electrical/electronic circuit problems (e.g., symbols).	P-1
06.10	Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine needed action.	P-1
06.11	Inspect and test fusible links, circuit breakers, and fuses; determine needed action.	P-1
06.12	Inspect, test, repair, and/or replace components, connectors, terminals, harnesses, and wiring in electrical/electronic systems (including solder repairs); determine needed action.	P-1

06.13 Test and measure circuit using an oscilloscope and/or graphing multimeter (GMM); interpret results; determine needed action.	P-1
06.14 Identify repair procedures for network connected systems.	P-1
06.15 Identify and interpret electrical/electronic system concern; determine necessary action.	
Battery Diagnosis and Service	
06.16 Maintain or restore electronic memory functions.	P-1
06.17 Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.	P-1
06.18 Perform slow/fast battery charge according to manufacturer's recommendations.	P-1
06.19 Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.	P-1
06.20 Identify safety precautions for high voltage systems on electric, hybrid, hybrid-electric, and diesel vehicles.	
06.21 Identify electrical/electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.	P-2
06.22 Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.	
06.23 Perform battery conductance test; determine necessary action.	
Starting System Diagnosis and Repair	
06.24 Perform starter current draw tests; determine needed action.	P-1
06.25 Perform starter circuit voltage drop tests; determine needed action.	P-1
06.26 Inspect and test starter relays and solenoids; determine needed action.	P-2
06.27 Remove and install starter in a vehicle.	P-1
06.28 Inspect and test switches, connectors, and wires of starter control circuits; determine needed action.	P-1
06.29 Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.	P-1
06.30 Demonstrate knowledge of an automatic idle-stop/start-stop system.	P-1
06.31 Diagnose a no-crank condition using a wiring diagram and test equipment; determine needed action.	P-1
Charging System Diagnosis and Repair	
06.32 Perform charging system output test; determine needed action.	P-1
06.33 Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.	P-1
06.34 Inspect, adjust, and/or replace alternator (generator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.	P-1
06.35 Remove, inspect, and/or replace alternator (generator); determine needed action.	P-1

06.36 Perform charging circuit voltage drop tests; determine needed action.	P-1
Lighting Systems Diagnosis and Repair	
06.37 Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	P-1
06.38 Describe operation and diagnosis of an adaptive headlight system.	
06.39 Identify system voltage and safety precautions associated with high-intensity discharge headlights.	P-2
06.40 Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action.	
Instrument Cluster and Driver Information Systems Diagnosis and Repair	
06.41 Inspect and test gauges and gauge sending units for causes of abnormal readings; determine needed action.	P-1
06.42 Diagnose the causes of incorrect operation of warning devices and other driver information systems; determine needed action.	P-1
06.43 Verify operation of instrument panel gauge sending units for causes of abnormal readings; determine needed action.	P-1
06.44 Inspect and test sensors, connectors, and wires of electronic (digital) instrument circuits; determine necessary action.	
Body Electrical Systems Diagnosis and Repair	
06.45 Diagnose vehicle comfort, convenience, access, safety, and related system operation; determine needed action.	P-2
06.46 Remove and reinstall door panel.	P-1
06.47 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 repairs.	P-2
06.48 Diagnose operation of entertainment and related circuits (such as: radio, DVD, remote CD changer, navigation, amplifiers, speakers, antennas, and voice-activated accessories); determine needed repairs.	P-2
06.49 Describe disabling and enabling procedures for supplemental restraint system (SRS); verify indicator lamp operation.	P-1
06.50 Verify windshield wiper and washer operation; replace wiper blades.	P-1
06.51 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, park assist, and back-up camera); determine needed repairs.	P-1
06.52 Diagnose body electronic systems circuits using a scan tool; check for module communication errors (data communication bus systems); determine needed action.	P-1
06.53 Describe the process for software transfer, software updates, or reprogramming of electronic modules.	P-1
06.54 Diagnose heated glass, mirror, or seat operation; determine necessary action.	

Course Description: The Engine Repair Technician prepares students for entry into the automotive service industry. Students explore career opportunities and requirements of a professional auto mechanic. Students study diagnostics and repair of general engine, cylinder heads, valve trains, engine block, lubrication, and cooling systems.

Abbreviations:
ER = Engine Repair

For every task in 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	**22**
P-2	**19**
P-3	**9**
Total	**50**

Course Number: AER0110 **Occupational Completion Point: E** **Engine Repair Technician – 150 Hours**	**Priority Number**
07.0 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)	
07.01 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 advance driver assistance systems (ADAS).	P-1
07.02 Retrieve and record DTCs, OBD monitor status, and freezeframe data; clear codes and date when directed.	
07.03 Verify operation of the instrument panel engine warning indicators.	P-1
07.04 Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1
07.05 Install engine covers using gaskets, seals, and sealers as required.	P-1
07.06 Verify engine mechanical timing and identify variable timing procedures.	P-1
07.07 Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	
07.08 Inspect, remove and/or replace engine mounts.	P-2
07.09 Identify service precautions related to service of the internal combustion engine of a hybrid electric vehicle.	P-2
07.10 Remove and reinstall engine on a newer vehicle equipped with OBD; reconnect all attaching components and restore the vehicle to running condition.	P-3
07.11 Identify and interpret engine concern; determine necessary action.	
07.12 Locate and interpret vehicle and major component identification numbers.	

07.13	Diagnose engine noises and vibrations; determine necessary action.	
07.14	Diagnose the cause of excessive oil consumption, coolant consumption, unusual engine exhaust color and odor; determine necessary action.	
07.15	Perform engine vacuum tests; determine necessary action.	
07.16	Identify cylinder head and valve train components and configurations.	P-1
07.17	Perform cylinder power balance tests; determine necessary action.	
07.18	Perform cylinder cranking and running compression tests; determine necessary action.	
07.19	Perform cylinder leakage tests; determine necessary action.	
Cylinder Head and Valve Train Diagnosis and Repair		
07.20	Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1
07.21	Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1
07.22	Inspect valve actuating mechanisms for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-2
07.23	Adjust valves (mechanical or hydraulic lifters).	P-1
07.24	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
07.25	Inspect valve springs for squareness and free height comparison; determine needed action.	P-3
07.26	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3
07.27	Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3
07.28	Inspect valves and valve seats; determine needed action.	P-3
07.29	Check valve spring assembled height and valve stem height; determine needed action.	P-3
07.30	Inspect valve lifters and hydraulic lash adjusters; determine needed action.	P-2
07.31	Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3
07.32	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3
Engine Block Assembly Diagnosis and Repair		
07.33	Identify engine block assembly components and configurations.	P-1
07.34	Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1

07.35	Disassemble engine block; clean and prepare components for inspection and reassembly.	P-1
07.36	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2
07.37	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2
07.38	Deglaze and clean cylinder walls.	P-2
07.39	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-2
07.40	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-2
07.41	Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2
07.42	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-3
07.43	Inspect and measure piston skirts and ring lands; determine needed action.	P-2
07.44	Determine piston-to-bore clearance.	P-2
07.45	Inspect, measure, and install piston rings.	P-2
07.46	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
07.47	Remove and replace piston pin; where applicable.	
07.48	Assemble engine block.	P-1
Lubrication and Cooling Systems Diagnosis and Repair		
07.49	Identify lubrication and cooling system components and configurations.	
07.50	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
07.51	Identify causes of engine overheating.	P-1
07.52	Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1
07.53	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
07.54	Inspect, remove, and replace water pump.	P-2
07.55	Remove and replace radiator.	P-2
07.56	Remove, inspect, and replace thermostat and gasket/seal.	P-1

07.57	Inspect and test fan(s), fan clutch (electrical or mechanical), fan shroud, and air dams; determine needed action.	P-1
07.58	Perform oil pressure tests; determine needed action.	P-1
07.59	Perform engine oil and filter change; use proper fluid type per manufacturer specification.	P-1
07.60	Inspect auxiliary coolers; determine needed action.	P-2
07.61	Inspect, test, and replace oil temperature and pressure switches and sensors.	P-2
07.62	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform needed action.	P-2
07.63	Inspect and replace engine cooling and heater system hoses.	

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 recommended that the program be Automotive Service Excellence (ASE) Education Foundation Master Certified (MAST) and the instructors be A1-A8 ASE Master and Advanced Engine Performance (L1) ASE Certified.

Career and Technical Student Organization (CTSO)

CTSOs are co-curricular career and technical student organizations 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. Other CTSOs not listed in this curriculum framework or recognized by the Florida Department of Education are permissible provided they support student mastery over the standards and benchmarks of this curriculum framework.

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 Career Certificate Programs 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: Computation (Mathematics) and Communications (Reading and Language Arts). 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, 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, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College System Institution must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

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.