



Riverside County Office of Education – Career Technical Education

RCOE AUTOMOTIVE SERVICE TECHNICIAN II (AST II)

DATE:

INDUSTRY SECTOR: Transportation Sector

PATHWAY: Systems Diagnostics, Service and Repair

CALPADS TITLE: Intermediate Systems Diagnostics, Service, and Repair (Concentrator)

CALPADS CODE: 8531

HOURS:

Total	Classroom	Laboratory/CC/CVE
180	60	120

JOB TITLE	O*NET CODE	JOB TITLE	O*NET CODE
Automotive Service Technicians and Mechanics	49-3023.00	Automotive Master Mechanics	49-3023.01
Automotive and Watercraft Service Attendants	53-6031.00	Automotive Specialty Technicians	49-3023.02

COURSE DESCRIPTION:

Auto AST II (Automotive Service Technician II) is the second in a series of three courses which will lead to industry certification and provide a foundation for post-secondary education or training. AST II is designed as a concentrator/capstone automotive mechanics course that develops student skills with automotive brakes, suspension-steering, and alignment service, diagnosis, and repair. After completion of this course, students will be prepared for student ASE Certification Exams as well as many entry-level positions in today's automotive service industry* and prepared to advance to AST III.

This course will also provide students with the opportunity to apply and extend concepts studied in their science and math classes; such as Pascal's Law, Ohm's Law, Boyles Law, and Newton's laws of motion (related to physics, geometry, arithmetic, algebra, electrical, computer, and chemical sciences) to the automotive technology industry.

*Brakes Installation/Repair Technician, Suspension-Steering Technician, Front-End Technician, and Alignment Technician.

A-G APPROVAL: G

ARTICULATION: None

DUAL ENROLLMENT: None

PREREQUISITES:

Prerequisite
RCOE Automotive Service Technician I (AST I) (Required)

METHODS OF INSTRUCTION

- Direct instruction
- Group and individual applied projects
- Multimedia
- Demonstration
- Field trips
- Guest speakers

STUDENT EVALUATION:

- Student projects
- Written work
- Exams
- Observation record of student performance
- Completion of assignment

INDUSTRY CERTIFICATION:

- None

RECOMMENDED TEXTS:

- Modern Automotive Technology James E. Duffy Goodheart-Willcox 9th Edition - 2017
<https://www.g-wonlinetextbooks.com/modern-automotive-technology->

PROGRAM OF STUDY

Grade	Fall	Spring	Year	Course Type	Course Name
9, 10, 11, 12				Introductory	RCOE Automotive - Automotive Service Technician I (AST I)
10, 11, 12				Concentrator	RCOE Automotive Service Technician II (AST II)-S
11, 12				Capstone	RCOE Automotive Service Technician III (AST III)

I.	UNIT 1: INTRODUCTION - AUTOMOTIVE PATHWAY AND CAREERS	CR	Lab/ CC	Standards
	<p>This unit will present an industry recognized ASE certification, employment opportunities, employment pathways options, and occupational careers.</p> <p>Key Assignment: Students will demonstrate their knowledge of automotive careers through a research project beginning with an interview of a professional currently employed in the industry. The written research project will include an explanation of the ASE (National Institute for Automotive Service Excellence) certification process. In addition to an interview, students will use reference materials, technical service bulletins, and other related documents as part of their research. Students will demonstrate their knowledge of basic shop operation by observing employees and their different job responsibilities while in the lab/shop, which includes successfully identifying the NATEF (National Automotive Technicians Education Foundation) related job designations.</p>	10	10	<p>Academic: RLST: 11-12.3</p> <p>CTE Anchor: Communications: 2.1</p> <p>CTE Pathway: C1.1</p>
II.	UNIT 2: CAREER PATHWAYS	CR	Lab/ CC	Standards
	<p>This unit will provide workplace employability personal soft-skills including:</p> <ul style="list-style-type: none"> • Punctuality • Receptive to directions • Motivation • Appropriate dress • Appropriate personal hygiene • Employment eligibility criteria • Honesty • Integrity • Reliability <p>Workplace Employability Skills-Work Habits/Ethics such as:</p> <ul style="list-style-type: none"> • Workplace policies/laws compliance • Teamwork • Negotiates solutions • Contributes ideas • Follows directions • Communicates effectively • Reads and interprets workplace documents • Writes clearly and concisely • Analyzes and resolves problems • Organizes a productive work plan • Courteous and knowledgeable customer services • Uses scientific, technical, engineering, and mathematics principles and reasoning to accomplish tasks <p>Job Search practices in the automotive profession including:</p> <ul style="list-style-type: none"> • Resume • Job application • Interview techniques Practice Interview <p>Key Assignments:</p> <ul style="list-style-type: none"> • Students will create a Portfolio of work including cover page, table of contents, cover letter, resume, recommendation letters, and samples of student work. • Students will participate in a practice interview with fellow student followed by a practice interview with a professional interviewer and obtaining at least one interview at a commercial auto shop. • Students will demonstrate in the lab/shop their knowledge of workplace employability standards by successfully completing the NATEF (National Automotive Technicians Education Foundation) related tasks. 	10	10	<p>Academic: RLST: 11-12.3</p> <p>CTE Anchor: Communications: 2.1</p> <p>CTE Pathway: C1.1</p>

III.	UNIT 3: GENERAL SHOP SAFETY - SHOP RULES & REGULATIONS	CR	Lab/ CC	Standards
	<p>This unit will discuss the safety procedures of tools and equipment:</p> <ul style="list-style-type: none"> • Floor jacks and jack stands safety procedures • Safe lift operation procedures • Ventilation safety procedures • Marked safety area • Fire safety equipment • Eyewash station procedures • Evacuation procedures • Personal safety devices and procedures • Vehicle safety procedures • Material safety data sheets (MSDS) <p>Key Assignment:</p> <ul style="list-style-type: none"> • In the lab/shop, students will practice safe handling, and storage, and disposal of chemicals and hazardous waste in accordance with the SDS and the requirements of local, state, and federal regulatory agencies. • Students will demonstrate in the lab/shop their knowledge of shop and personal safety by successfully completing the NATEF (National Automotive Technicians Education Foundation) related tasks, such as researching a specific chemical in the shop and reporting on the safety considerations, chemical properties, and environmental influences of the chemical are chosen. 	10	25	<p>Academic: RLST: 11-12.3</p> <p>CTE Anchor: Communications: 2.1</p> <p>CTE Pathway: C1.1</p>
IV.	UNIT 4: TOOLS & EQUIPMENT - TOOL IDENTIFICATION	CR	Lab/ CC	Standards
	<p>This unit covers how to identify and use hand tools, precision measuring tools, power tools, and shop equipment.</p> <p>Key Assignments:</p> <ul style="list-style-type: none"> • In the lab/shop, students will practice appropriate selection, use, and storage of precision measuring tools including micrometer, dial indicator, digital caliper, feeler gauge, torque wrench, bore gauge, and tape measure • Students will demonstrate in the lab/shop their knowledge of tool and equipment use, maintenance, and storage by successfully completing the NATEF (National Automotive Technicians Education Foundation) related tasks. These tasks include measuring and evaluating brake rotors and pads, measuring and evaluating brake drums and shoes, and torquing fasteners. 	10	25	<p>Academic: RLST: 11-12.3</p> <p>CTE Anchor: Communications: 2.1</p> <p>CTE Pathway: C1.1</p>
V.	UNIT 5: BRAKE SYSTEMS (A5)	CR	Lab/ CC	Standards
	<p>In this unit, students will apply their knowledge/utilization of personal protection, maintenance, hazardous materials handling, storage, and recycling procedures by successfully completing the NATEF (National Automotive Technicians Education Foundation) related tasks. Students will also learn to perform brake inspections, brake component replacement, fluid service, and recycling operations of a modern automotive brake system. Students will be able to evaluate brake components and fluid conditions, use service information systems to determine system capacities, and determine necessary actions.</p> <p>Key Assignments:</p> <p>Hydraulic Service</p> <p>In the lab/shop, students will practice removing, installing, and servicing brake system hydraulic components. Students will also learn to flush/bleed brake fluid hydraulic systems using multiple industry-specific techniques, such as pressure bleeding, vacuum bleeding, and manual bleeding. Students will also be aware of gravity bleeding techniques.</p> <p>The students will perform the following NATEF tasks:</p>	10	25	<p>Academic: RLST: 11-12.3</p> <p>CTE Anchor: Communications: 2.1</p> <p>CTE Pathway: C1.1</p>

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).
2. Measure brake pedal height, travel, and free play (as applicable); determine needed action.
3. Check master cylinder for internal/external leaks and proper operation; determine needed action.
4. Remove, bench bleed, and reinstall master cylinder.
5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action.
6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, and loose fittings/supports; determine needed action.
7. Replace brake lines, hoses, fittings, and supports.
8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).
9. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification.
10. Inspect, test, and/or replace components of brake warning light system.
11. Identify components of a hydraulic brake warning light system.
12. Bleed and/or flush the brake system.
13. Test brake fluid for contamination.

Disk Brake Service

In this unit, students will perform the following NATEF tasks:

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

Drum Brake Service

In this unit, students will perform the following NATEF tasks:

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action.
 1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability.
 2. Refinish brake drum and measure final drum diameter; compare with the specification.

	<p>3. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.</p> <p>4. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.</p> <p>5. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments.</p> <p>Related Brake Systems Service</p> <p>In this unit, students will perform the following NATEF tasks:</p> <ol style="list-style-type: none"> 1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action. 2. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. 3. Check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. 4. Check parking brake operation and parking brake indicator light system operation; determine needed action. 5. Check operation of brake stop light system. 6. Replace wheel bearing and race. 7. Inspect and replace wheel studs. 8. Remove, reinstall, and/or replace a sealed wheel bearing assembly. 			
VI.	UNIT 6: SUSPENSION & STEERING	CR	Lab/ CC	Standards
	<p>In this unit, students will learn general suspension and steering systems diagnosis.</p> <p>- Recall subjects will include wheels and tires purchasing, diagnosis, and repair as well as wheel bearing service (covered in AST1).</p> <p>Students will practice suspension system diagnosis by researching applicable vehicle and service information (including the use of technical service bulletins (TSB's), campaigns, and recalls), vehicle service history, and service precautions. Students will also practice wheels and tires diagnosis by inspecting tire condition, identifying tire wear patterns, performing tire rotation, checking for correct tire size and adjusting air pressure; dismount, mount, and balance the tire on a wheel with and without a tire pressure monitoring system sensor. The student will test, adjust and calibrate the tire pressure monitoring system according to vehicle manufacturer recommendations.</p> <p>For every task in Suspension and Steering, the following safety requirement must be strictly enforced:</p> <p>Students will also 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.</p> <p>Students will demonstrate in the lab/shop their knowledge of suspension and steering by successfully completing the NATEF (National Automotive Technicians Education Foundation) related tasks.</p> <p>Key Assignments:</p> <p>Wheel Alignment Diagnosis, Adjustment, and Repair</p> <p>In this unit, students will perform the following NATEF tasks:</p> <ol style="list-style-type: none"> 1. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine needed action. 2. Perform pre-alignment inspection; measure vehicle ride height; determine needed action. 3. 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. 	10	25	<p>Academic: RLST: 11-12.3</p> <p>CTE Anchor: Communications: 2.1</p> <p>CTE Pathway: C1.1</p>

4. Check toe-out-on-turns (turning radius); determine needed action.
5. Check steering axis inclination (SAI) and included angle; determine needed action.
6. Check rear wheel thrust angle; determine needed action.
7. Check for front wheel setback; determine needed action.
8. Check front and/or rear cradle (subframe) alignment; determine needed action.
9. Reset steering angle sensor.

Steering Systems Diagnosis and Repair

In this unit, students will perform the following NATEF tasks:

1. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.
2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
3. Diagnose steering column noises, looseness, and binding concerns (including tilt/telescoping mechanisms); determine needed action.
4. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.
5. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine needed action.
6. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; determine needed action.
7. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.
8. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.
9. Inspect power steering fluid level and condition.
10. Flush, fill and bleed power steering system; using proper fluid type per manufacturer specification.
11. Inspect for power steering fluid leakage; determine needed action.
12. Remove, inspect, replace, and/or adjust power steering pump drive belt.
13. Remove and reinstall the power steering pump.
14. Remove and reinstall press-fit power steering pump pulley; check pulley and belt alignment.
15. Inspect, remove, and/or replace power steering hoses and fittings.
16. Inspect, remove, and/or replace pitman arm, relay (center link/intermediate) rod, idler arm, mountings, and steering linkage damper.
17. Inspect, replace, and/or adjust tie rod ends (sockets), tie rod sleeves, and clamps.
18. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
19. Inspect the electric power steering assist system.

Suspension Systems Diagnosis and Repair

In this unit, students will perform the following NATEF tasks:

1. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine needed action.
2. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine needed action.
3. Inspect, remove and/or replace upper and lower control arms, bushings, shafts, and rebound bumpers.
4. Inspect, remove and/or replace strut rods and bushings.
5. Inspect, remove and/or replace upper and/or lower ball joints (with or without wear indicators).
6. Inspect, remove and/or replace steering knuckle assemblies.
7. Inspect, remove and/or replace short and long arm suspension system coil springs and spring insulators.

8. Inspect, remove and/or replace torsion bars and mounts.
9. Inspect, remove and/or replace front/rear stabilizer bar (sway bar) bushings, brackets, and links.
10. Inspect, remove and/or replace strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.
11. Inspect, remove and/or replace track bar, strut rods/radius arms, and related mounts and bushings.
12. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.

Related Suspension and Steering Service

In this unit, students will perform the following NATEF tasks:

1. Inspect, remove, and/or replace shock absorbers; inspect mounts and bushings.
2. Remove, inspect, service, and/or replace the front and rear wheel bearings.
3. Describe the function of suspension and steering control systems and components, (i.e., active suspension and stability control).

Wheels and Tires Diagnosis and Repair

In this unit, students will perform the following NATEF tasks:

1. 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.
2. Diagnose wheel/tire vibration, shimmy, and noise; determine needed action.
3. Rotate tires according to manufacturers' recommendation including vehicles equipped with tire pressure monitoring system (TPMS).
4. Measure wheel, tire, axle flange, and hub runout; determine needed action.
5. Diagnose tire pull problems; determine needed action.
6. Dismount, inspect, and remount tire on a wheel; balance wheel and tire assembly.
7. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
8. Inspect tire and wheel assembly for air loss; determine needed action.
9. Repair tire following vehicle manufacturer approved procedure.
10. Identify indirect and direct tire pressure monitoring systems (TPMS); calibrate system; verify operation of instrument panel lamps.
11. Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system (TPMS), including relearn procedure.

VII. COURSE NOTES	CR	Lab/ CC	Standards
Completed by ASG 5/24/19 – Saved to S drive – John Bruestle	0	0	Academic: RLST: 11-12.3 CTE Anchor: Communications: 2.1 CTE Pathway: C1.1

Entered by:

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