

AUTO 154: CHASSIS SERVICE, DIAGNOSIS, AND REPAIR

Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2023
Credits:	9
Total Contact Hours:	270
Lecture Hours :	108
Lab Hours:	162
Hours Arranged:	0
Outside of Class Hours:	216
Prerequisite:	AUTO 166.
Transferable to CSU:	Yes
Transferable to UC:	No
Grading Method:	Standard Letter

Catalog Course Description

Intended for those seeking a career in the automotive service and repair industry. This Automotive Service Excellence Education Foundation certified course is one component of the Toyota Technician Training and Education Network (T-TEN) program. The course covers essential chassis system theory, along with inspection, diagnosis, service and repair of the following undercar systems: brake, steering, suspension, wheel alignment, wheels & tires, ride control, and VSC. Course prepares students for ASE Suspension and Steering (A4) and ASE Brakes (A5) certification. 108 lecture hours, 162 lab hours.

Course Objectives

- For ASE Section A4: Learning Outcomes and Final Skill Performances
 - Instructional Unit 1: Wheels & Tires
 - Learning Outcome: Diagnose and service wheels and tires
 - FSP (written): Describe tire construction, nomenclature, materials and decode tire information and ensure correct application
 - FSP (skills): Dismount, repair, mount and balance tire
 - FSP (written): Phase-match tire & wheel assembly to provide the lowest RFV
 - FSP (written): Retrieve & interpret tire pressure sensor DTCs and data from TPMS ECU.
 - FSP (written): Perform tire pressure compensation adjustment
 - Instructional Unit 2: Suspension & Steering Systems Theory and Components
 - Learning Outcome: Inspect suspension components
 - FSP (Written): Identify suspension systems, subsystems, and components
 - FSP (skills): Inspect and adjust (where applicable) vehicle ride height
 - Learning Outcome: Identify steering components
 - FSP (written): Identify steering systems, subsystems, and components?
 - Instructional Unit 3: Wheel Alignment
 - Learning Outcome: Inspect, diagnose, and service wheel alignment
 - FSP (skills): Inspect and adjust wheel alignment
 - FSP (written): Diagnose bent components
 - FSP (written): Diagnose drift and pull
 - FSP (written): Diagnose abnormal tire wear
 - FSP (written): Initialize steering angle sensors
 - Instructional Unit 4: Suspension System Service and Repair
 - Learning Outcome: Inspect and repair suspension systems
 - FSP (written): Inspect shock-absorber and strut operation
 - FSP (skills): Inspect bushings, ball joints and strut mounts
 - FSP (written): Replace struts and strut mounts
 - FSP (written): R&R control arms, bushings and ball joints
 - FSP (written): Retrieve & interpret DTCs and data from electronic suspension systems (e.g. TEMS, KDSS,

- etc.)
 - Instructional Unit 5: Steering Systems Service and Repair
 - Learning Outcome: Inspect and repair steering systems
 - FSP (skills): Inspect inner and outer tie-rod ends
 - FSP (written): Inspect and repair steering columns, spiral cables, and steering angles sensors
 - FSP (written): Inspect and replace rack-and-pinion steering gears
 - Learning Outcome: Inspect and repair power-assist systems
 - FSP (written): Inspect hydraulic power-steering system operation
 - FSP (written): Inspect electrically-assisted steering operation
 - FSP (written): Retrieve & interpret DTCs and data from electronic power steering systems
 - For ASE section A5: Learning Outcomes and Final Skill Performances
 - Instructional Unit 1: Hydraulic and Power-Assist Systems
 - Learning Outcome: Inspect, service, diagnose and repair brake hydraulic systems.
 - FSP (written): Inspect brake hydraulic system operation and determine fault(s).
 - Learning Outcome: Diagnose and repair brake power assist systems
 - FSP (written): Inspect brake power-assist system operation and determine fault(s).
 - Instructional Unit 2: Drum Brake System.
 - Learning Outcome: Inspect, service, diagnose and repair drum brake system.
 - FSP (written): Remove and reinstall brake shoes.
 - FSP (skill): Measure drum diameter and out of round.
 - FSP (skill): Machine drums to manufacturer's standards.
 - Instructional Unit 3: Disc Brake System.
 - Learning Outcome: Inspect, service, diagnose and repair disc brake systems.
 - FSP (skill): Measure rotor thickness and variation of parallelism
 - FSP (skill): Machine disc brake rotors using an off-vehicle brake lathe
 - FSP (written): Machine disc brake rotors using an on-vehicle brake lathe
 - Instructional Unit 4: Vehicle Stability Control
 - Learning Outcome: Inspect, service, diagnose and repair Vehicle Stability Control (VSC) systems
 - FSP (written): Diagnose VSC system fault(s)
 - FSP (written): Diagnose an VSC related Controller Area Network (CAN) communication fault(s)

Major Course Content

For ASE/NATEF Content Area A4:

- Instructional Unit 1: Wheels & Tires
 - Tire structure and markings
 - Tire repair, mounting and balancing
 - Tire wear and maintenance
 - Tire Pressure Monitoring Systems
- Instructional Unit 2: Suspension & Steering Systems Theory and Components
 - Independent vs. non-independent
 - Short/Long Arm (double-wishbone) Suspension
 - MacPherson Strut
 - Solid axle
 - Torsion beam (semi-independent)
 - Coil springs
 - Leaf springs
 - Torsion bars
 - Bushings
 - Ball joints
 - Rack-and-pinion steering gears
 - Recirculating ball steering gears
 - Parallelogram steering linkage and components
 - Haltenberger steering linkage and components
 - Relay rod (cross steer) steering linkage and components
 - Inner and outer tie rod ends

3. Instructional Unit 3: Wheel Alignment
 - a. Camber
 - b. Caster
 - c. Toe
 - d. Thrust Angle
 - e. Steering Axis Inclination/King Pin Inclination
 - f. Included Angle
 - g. Setback
 - h. Ackerman geometry
 - i. Turning radius (Toe Out On Turns)
4. Instructional Unit 4: Suspension Systems Service and Repair
 - a. Bushing R&R
 - b. Ball joint R&R
 - c. Strut and strut mount R&R
 - d. Electronic suspension systems
5. Instructional Unit 5: Steering Systems Service and Repair
 - a. Rack and pinion steering gear R&R
 - b. Inner and Outer tie-rod end R&R
 - c. Hydraulic power steering systems
 - d. Electrical and electronic steering assist systems

For ASE/NATEF Content Area A5:

1. Instructional Unit 1: Hydraulic System and Power Assist System
 - a. Pascal's law / hydraulic principles
 - b. Component ID
 - c. Brake fluid types, safety and handling procedures
 - d. Master cylinder operation and service
 - e. Hydraulic system configuration / metering / proportioning
 - f. Bleeding procedures
 - g. Hard line and hose service
 - h. Vacuum boosters operation, testing and service
 - i. Hydraulic brake booster operation, testing and service
2. Instructional Unit 2: Drum Brake System
 - a. Friction lining safety and handling procedures
 - b. Brake shoes and hardware service
 - c. Brake drum machining and service
 - d. Wheel cylinders
3. Instructional Unit 3: Disc Brake System
 - a. Brake Pads
 - b. Caliper service and replace
 - c. Brake rotor service
 - d. Wheel bearing service
4. Instructional Unit 4: Vehicle Stability Control (VSC)
 - a. Component ID
 - b. VSC Function Test
 - c. Diagnostic Trouble Code (DTC) code retrieval and scan data
 - d. VSC Inputs
 - e. VSC Outputs/Actuators

Lab Content

For ASE/NATEF Content Area A4:

Course Worksheets Organized by Instructional Unit

1. Instructional Unit 1: Wheels & Tires
 - a. GWS 154-01: Tire and Wheel System Basics
 - b. GWS 154-02: Tire and Wheel Service & Repair Procedures
 - c. 453 TW01: Wheel Run-Out and RFV
 - d. 453 TW02: Tire Pressure Monitoring System
 - e. GWS 154-03: TPMS Service Procedures
2. Instructional Unit 2: Suspension & Steering Systems Theory and Components
 - a. GWS 154-04: Suspension System Basics
 - b. GWS 154-05: Steering System Basics
 - c. 453 TW03: Vehicle Inspection
 - d. 453 TW07: Test Drive
3. Instructional Unit 3: Wheel Alignment Inspection, Diagnosis, and Service
 - a. 453 TW04: Alignment Test
 - b. GWS 154-06: Wheel Alignment Procedures
 - c. 453 TW05: Alignment Geometry
 - d. 453 TW06: Interpret Wheel Alignment Values and Service Information
 - e. 453 TW08: Alignment Demo
 - f. 453 TW09 (a & b): Diagnosing Using SAI and IA
 - g. GWS 154-07: Wheel Alignment Diagnosis
4. Instructional Unit 4: Suspension Systems Service and Repair
 - a. GWS 154-08: Control Arms, Bushings and Ball Joint Service Procedures
 - b. GWS 154-09: Shock Absorber and Strut Service Procedures
 - c. GWS 154-10: Electronic Suspension System Basics
5. Instructional Unit 5: Steering Systems Service and Repair
 - a. GWS 154-11: Steering Column Service Procedures
 - b. GWS 154-12: Hydraulic Power Steering System Diagnosis
 - c. GWS 154-13: Hydraulic Power Steering System Service Procedures
 - d. GWS 154-14: Electronic Steering System Diagnosis

For ASE/NATEF Content Area A5:

Course Worksheets Organized by Instructional Unit

1. Instructional Unit 1: Hydraulic System and Power Assist System
 - a. GWS 155-01: Brake Hydraulic System Basics
 - b. GWS 155-02: Brake Master Cylinder Inspection Procedures
 - c. GWS 155-03: Brake Hydraulic System Service Procedures
 - d. GWS 155-04: Brake Power Assist System Basics
 - e. 553 TW02: Brake Booster: Booster Checks
 - f. 553 TW03: Brake Booster: Push Rod Adjustment
 - g. 553 TW04: Brake Pedal Measurement
2. Instructional Unit 2: Drum Brake System
 - a. GWS 155-05: Drum Brake System Inspection and Service Procedures
 - b. GWS 155-06: Brake Drum Inspection and Resurfacing Procedures
3. Instructional Unit 3: Disc Brake System
 - a. GWS 155-07: Disc Brake System Inspection and Service Procedures
 - b. 553 TW01: Rotor Parallelism, Run-out & Phase matching
 - c. GWS 155-08: Brake Rotor Resurfacing Procedures
4. Instructional Unit 4: Vehicle Stability Control

- a. 553 TW05: ABS Diagnostics: CAN Diagnostics
- b. 553 TW06: ABS Diagnostics: ABS and TechStream
- c. 553 TW07: ABS Diagnostics: Active Wheel Speed Sensors
- d. 553 TW08: Hydraulic Brake Booster
- e. GWS 155-09: VSC System Diagnosis

Suggested Reading Other Than Required Textbook

Electronic journals, printed magazines, on-line articles.

Examples of Required Writing Assignments

Each week, you must read at least one automotive related technical article from a magazine or web-site of your choice. The article should pertain to one of the topics identified for that weeks' study. A copy of the article will be turned in, along with a word processed document that includes a 1-paragraph summary and a 1-paragraph response written in your own words (for format requirements, see below.)

Minimum Word-Processing Requirements

All written assignments (essays, research papers, reports, technical-article summaries, etc.) shall be word-processed and include student name, course number, and date single-spaced in the upper right-hand corner. The text of the assignment will be justified (text aligned on the left and right) with 1-inch margins (left, right, top & bottom), double-spaced, and shall use a twelve-point font.

Examples of Outside Assignments

Students will locate a relative technical article and write an evaluation of that article, including its technical merit, application to current course topics, and the usefulness of the article to their continued studies.

Instruction Type(s)

Lab, Lecture, Online Education Lecture