

## COURSE SYLLABUS

<b>LAST REVIEW</b>	Fall 2022
<b>COURSE TITLE</b>	Automotive Chassis Systems
<b>COURSE NUMBER</b>	AUTT-0242
<b>DIVISION</b>	Career and Technical Education
<b>DEPARTMENT</b>	AUTT
<b>CIP CODE</b>	47.0604
<b>CREDIT HOURS</b>	5
<b>CONTACT HOURS/WEEK</b>	Class: 2                      Lab: 6
<b>PREREQUISITES</b>	AUTT-0103; AUTT-0142; AUTT-0152
<b>COREQUISITES</b>	None
<b>COURSE PLACEMENT</b>	None

### COURSE DESCRIPTION

In this course students will study and perform tasks from the National Automotive Technicians Education Foundation's (NATEF) Automobile Service Technology (AST) Program. These studies include elements of training from steering, suspension, and brakes to continue on the training received in the Maintenance and Light Repair program. Additional training in advanced elements of chassis electronics is offered in the Master Automobile Service Technology (MAST) program. All students will successfully complete each element of personal safety training before working in the Automotive Laboratory.

### PROGRAM ALIGNMENT

This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:

[https://kansasregents.org/workforce\\_development/program-alignment](https://kansasregents.org/workforce_development/program-alignment)

### PROGRAM LEARNING OUTCOMES

1. Demonstrate adherence to safety and pollution prevention standards according to OSHA and EPA regulations.
2. Demonstrate the ability to communicate effectively in workplace scenarios with an appropriate level of preparedness for daily tasks and assignments.
3. Demonstrate the ability to diagnose and repair mechanical and electrical damage according to Original Equipment Manufacturer (OEM) specifications and recommendations.

### TEXTBOOKS

<http://kckccbookstore.com/>

## **METHODS OF INSTRUCTION**

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

## **COURSE OUTLINE**

- I. Steering Systems Diagnosis and Repair
  - A. Remove and replace steering wheel
    1. Centering
    2. Clock spring
    3. SRS safety
    4. Switches
  - B. Steering Column
    1. Noises
    2. Looseness
    3. Binding concerns
    4. Tilt mechanisms
    5. Flexible coupling
    6. Collapsible column
    7. Lock cylinder mechanism
    8. Universal joint
  - C. Steering Gear
    1. Binding
    2. Uneven turn effort
    3. Looseness
    4. Hard steering
    5. Noise
  - D. Rack and pinion
    1. Binding
    2. Uneven turning effort
    3. Looseness
    4. Hard steering
    5. Noise
    6. Mounting bushings
    7. Brackets
  - E. Power steering pump
    1. Pressure testing
    2. Dead heading
    3. Power steering pulley
    4. Belt alignment and tension
  - F. Electric power assist

1. Safety concerns
  2. Inspection
- II. Suspension Systems
- A. Short and Long Arm (SLR) suspension
    1. Coil spring
    2. Insulators
    3. Bushings
    4. Unloading spring for service
  - B. Strut assemblies
    1. Cartridge service
    2. Spring service
    3. Bearing mounts
    4. Insulators
    5. Loading and unloading spring for service
  - C. Stabilizer/sway bars
    1. Bushings
    2. Links
    3. Panhard rods
  - D. Torsion bars
  - E. Leaf springs
  - F. Air suspension
  - G. Ride height
  - H. Steering knuckle assemblies
  - I. Track bars
  - J. Radius arms
  - K. Trailing arms
  - L. Bushing service
  - M. Wheel bearing service
- III. Wheel Alignment
- A. Diagnosis
    1. Pulls/push
    2. Wander
    3. Drift
    4. Hard steering
    5. Bump steer
    6. Memory steer
    7. Torque steer
    8. Steering return
  - B. Pre alignment
  - C. 4 wheel alignment
  - D. Alignment angles
    1. Caster
    2. Camber
    3. Toe

4. Toe out on turns
  5. Turning radius
  6. Steering Axis Inclination (SAI)
  7. Included angle
  8. Rear wheel thrust angle
  9. Wheel setback
  10. Cradle (subframe) alignment
  11. Scrub radius
- E. Steering angle sensor
- IV. Wheels and Tires
- A. Vibration
1. Balance
  2. Vibration
  3. Shimmy
  4. Noise
  5. Wheel runout
  6. Tire runout
  7. Flange runout
  8. Hub runout
- V. Brake Hydraulics
- A. Pascal's law
- B. Master cylinder
- C. Bench bleeding
- D. Symptoms of hydraulic problems
1. Poor stopping
  2. Pulling
  3. Dragging
  4. Leaks
- E. Brake lines
- F. Hoses
- G. Fittings
- H. Supports
- I. Fabrication
1. Brake line sealing washers
  2. Making double flares
  3. Making ISO flares
  4. Bending
- J. Pressure testing
- K. Internal leakage
- L. Warning lights
- VI. Disc and Drum Diagnosis
- A. Poor stopping
- B. Vibration
- C. Noise

- D. Pulling
- E. Dragging
- F. Pulsation
- VII. Power Assisted Brakes
  - A. Vacuum type booster
    - 1. Testing
    - 2. Check valve
  - B. Hydraulically assisted systems
  - C. Pushrod length
  - D. Diagnosis
- VIII. Wheel Bearing
  - A. Service
  - B. Noises
  - C. Shimmy
  - D. Vibration
  - E. Sealed bearing service
  - F. Conical bearing service
  - G. Press operation
- IX. Electronic Brakes
  - A. Electric brake components
  - B. Trailer brakes

## **COURSE LEARNING OUTCOMES AND COMPETENCIES**

Upon successful completion of this course, the student will:

- A. Demonstrate knowledge of steering systems diagnosis and repair.
  - 1. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
  - 2. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.
  - 3. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.
  - 4. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.
  - 5. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.
  - 6. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.
  - 7. Remove and reinstall power steering pump.
  - 8. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.
  - 9. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
  - 10. Inspect electric power-assisted steering.

- B. Demonstrate knowledge of suspension systems diagnosis and repair.
  - 11. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action.
  - 12. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.
  - 13. Inspect, remove and install steering knuckle assemblies.
  - 14. Inspect, remove and install short and long arm suspension system coil springs and spring insulators.
  - 15. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.
  - 16. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings.
  
- C. Demonstrate knowledge of related suspension and steering service.
  - 17. Remove, inspect, and service or replace front and rear wheel bearings.
  
- D. Demonstrate knowledge of wheel alignment diagnosis, adjustment, and repair.
  - 18. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.
  - 19. 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.
  - 20. Check toe-out-on-turns (turning radius); determine necessary action.
  - 21. Check SAI (steering axis inclination) and included angle; determine necessary action.
  - 22. Check rear wheel thrust angle; determine necessary action.
  - 23. Check for front wheel setback; determine necessary action.
  - 24. Check front and/or rear cradle (subframe) alignment; determine necessary action.
  - 25. Reset steering angle sensor.
  
- E. Demonstrate knowledge of wheels and tires diagnosis and repair.
  - 26. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
  - 27. Measure wheel, tire, axle flange, and hub runout; determine necessary action.
  - 28. Diagnose tire pull problems; determine necessary action.
  
- F. Demonstrate knowledge of general and hydraulic system diagnosis and repair.
  - 29. Identify and interpret brake system concerns; determine necessary action.
  - 30. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).
  - 31. Remove, bench bleed, and reinstall master cylinder.
  - 32. Diagnose poor stopping, pulling or dragging concerns caused by

- malfunctions in the hydraulic system; determine necessary action.
33. Replace brake lines, hoses, fittings, and supports.
  34. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types).
  35. Inspect, test, and/or replace components of brake warning light system.
- G. Demonstrate knowledge of disc and drum brake diagnosis and repair.
36. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action.
  37. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.
- H. Demonstrate knowledge of power-assist unit diagnosis and repair.
38. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action.
  39. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action.
  40. Measure and adjust master cylinder pushrod length.
- I. Demonstrate knowledge of wheel bearing service.
41. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action.
  42. Remove and reinstall sealed wheel bearing assembly.
- J. Demonstrate knowledge of electronic brake, traction and stability control systems diagnosis and repair.
43. Identify and inspect electronic brake control system components; determine necessary action.

### **ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES**

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

### **COLLEGE POLICIES AND PROCEDURES**

*Student Handbook*

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

*College Catalog*

<https://www.kckcc.edu/academics/catalog/index.html>

*College Policies and Statements*

<https://www.kckcc.edu/about/policies-statements/index.html>

*Accessibility and Accommodations*

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.