DATE OF LAST REVIEW : 02/11/2013

CIP CODE: 47.0604

SEMESTER: Departmental Syllabus

COURSE TITLE: Steering and Suspension 2

COURSE NUMBER: AUTT0241

CREDIT HOURS: 2

INSTRUCTOR: Departmental Syllabus

OFFICE LOCATION: Departmental Syllabus

OFFICE HOURS: Departmental Syllabus

TELEPHONE: Departmental Syllabus

EMAIL : KCKCC issued email accounts are the official means for electronically communicating with our students.

PREREQUISITE(S): AUTT0101, AUTT0102, AUTT0141, or approval from instructor

REQUIRED TEXT AND MATERIALS:
Please see bookstore for current textbook(s) and other required material.

COURSE DESCRIPTION:
In this course students will perform complex diagnostics and repair on steering and suspension systems. Additionally, students will perform pre-alignment inspection and complex repairs of wheel and tire systems.

METHOD 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, and panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.
COURSE OUTLINE:
All students must 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.

I. Documenting complex suspension system concerns
   A. Completing work order
      1. Vehicle identifying information
      2. Customer concerns
      3. Service history
      4. Cause
      5. Correction
   B. Identifying and interpret concerns
   C. Researching vehicle information
      1. Operation
      2. Precautions
      3. Technical service bulletins
   D. Locating and interpreting identification numbers

III. Diagnostics of steering systems
   A. Steering column
      1. Noises
      2. Looseness
      3. Binding
   B. Power steering gear
      1. Binding
      2. Turning effort
      3. Looseness
      4. Hard steering
      5. Noise
   C. Rack and pinion
      1. Binding
      2. Turning effort
      3. Looseness
      4. Hard steering
      5. Noise
   D. Power steering fluid
      1. Types
      2. Fluid level
      3. Condition
   E. Fluid leakage
   F. Electronically controlled steering systems
   G. Using scan tool
   H. Hybrid vehicle power steering systems
      1. Safety
   I. Electronic steering systems
      1. Switches
2. Sensors
3. Idle speed compensation switch

III. Perform complex repairs of steering systems
   A. Disabling supplemental restraint systems (SRS).
   B. Steering wheel
      1. Replacing
      2. Centering
      3. SRS
      4. Coil/clock spring
   C. Steering shafts
      1. Universal-joint(s)
      2. Flexible coupling(s)
      3. Collapsible columns
      4. Lock cylinder mechanisms
   D. Adjust pinion worm bearing preload and sector lash
   E. Rack and pinion steering gear
      1. Mounting bushings
      2. Brackets
      3. Inner tie rod ends
   F. Power steering system
      1. Flush
      2. Fill
      3. Bleed
      4. Belt
      5. Press fit power steering pump pulleys
      6. Belt alignment
      7. Hoses and fittings
   G. Steering linkage
      1. Pitman arm
      2. Centerlink
      3. Idler arm
      4. Mountings
      5. Dampers
      6. Tie rods
   H. Electronically controlled steering systems
      1. Sensors
      2. Switches
      3. Actuators
      4. Lubrication

IV. Performing complex diagnostics of suspension systems
   A. Short and long arm suspension
      1. Noises
      2. Body sway
      3. Uneven
      4. Ride height
B. Strut suspension
   1. Noises
   2. Body sway
   3. Uneven ride height
C. Electronically controlled suspension
   1. Scan tools
V. Performing repairs of suspension systems
   A. Short and long arm suspension system
      1. Noises
      2. Body sway
      3. Uneven ride height
   B. Strut suspension system
      1. Noises
      2. Body sway
      3. Uneven ride height
   C. Upper and lower control arms
      1. Bushings
      2. Shafts
      3. Rebound bumpers
      4. Strut rods and bushings
      5. Upper and/or lower ball joints
      6. Steering knuckle assemblies
   D. Coil springs
      1. Spring insulators
   E. Torsion bars
   F. Stabilizer bar
      1. Bushings
      2. Brackets
      3. Links
   G. Strut cartridge
      1. Strut coil spring
      2. Insulators (silencers)
      3. Bearing mount
   H. Leaf springs
      1. Insulators (silencers)
      2. Shackles
      3. Brackets
      4. Bushings
      5. Mounts
VI. Performing pre-alignment inspections and necessary actions
   A. Diagnosing
      1. Wander
      2. Drift
      3. Pull
      4. Hard steering
      5. Bump steer
6. Memory steer
7. Torque steer
8. Steering return
B. Pre-alignment inspection and measure
   1. Ride height
C. Wheel alignment
   1. Alignment machines
   2. 4 wheel alignment
   3. Front and rear alignment
   4. Caster
   5. Camber
   6. Toe
   7. Center steering wheel
   8. Toe-out-on-turns
   9. SAI (steering axis inclination)
   10. Included angle
   11. Thrust angle
   12. Scrub radius
   13. Setback
   14. Subframe/cradle alignment
VII. Perform complex diagnostics of wheel and tire systems
   A. Vibration
   B. Shimmy
   C. Noise
   D. Run-out
      1. Wheel
      2. Tire
      3. Axle flange
      4. Hub
   E. Tire pull problems
   F. Tire pressure monitoring system
VIII. Performing complex repairs of wheel and tire systems
   A. Tire wear patterns
   B. Air pressure
   C. Tire rotation
   D. Dismount and remount tire on wheel
   E. Balance wheel and tire assembly (static and dynamic)
   F. Dismount, inspect, and remount tire on wheel
   G. Protecting tire pressure monitoring systems
   H. Reinstall wheel; torque lug nuts
   I. Tire and wheel inspection
   J. Repair tire using internal patch

EXPECTED LEARNER OUTCOMES:
   A. The student will be able to perform general suspension and steering systems diagnostics
B. The student will be able to describe steering systems diagnosis and repair
C. The student will be able to explain suspension systems diagnosis and repair
D. The student will be able to describe complex diagnostics of suspension systems
E. The student will explain perform complex repairs of suspension systems
H. The student will be able to review pre-alignment inspection and necessary actions
I. The student will be able to explain complex repairs of wheel and tire systems
J. The student will be able to describe complex diagnostics of wheel and tire systems

**COURSE COMPETENCIES:**

*The student will be able to perform general suspension and steering systems diagnostics*

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
2. Identify and interpret suspension and steering system concerns; determine necessary action
3. Research applicable vehicle and service information, such as suspension and steering system operation, vehicle service history, service precautions, and technical service bulletins
4. Locate and interpret vehicle and major component identification numbers
   *The student will be able to describe steering systems diagnosis and repair*
5. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action
6. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action
7. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action
8. Determine proper power steering fluid type; inspect fluid level and condition
9. Diagnose power steering fluid leakage; determine necessary action
10. Test and diagnose components of electronically controlled steering systems using a scan tool; determine necessary action
11. Inspect and test electric power assist steering
12. Identify hybrid vehicle power steering system electrical circuits, service and safety precautions
13. Diagnose, inspect, adjust, repair or replace components of electronically controlled steering systems (including sensors, switches, and actuators); initialize system as required
14. Describe the function of the idle speed compensation switch
   *The student will be able to explain suspension systems diagnosis and repair*
15. Disable and enable supplemental restraint system (SRS)
16. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring)
17. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action
18. Adjust non-rack and pinion worm bearing preload and sector lash
19. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets
20. Inspect and replace rack and pinion steering gear inner tie rod ends (sockets) and bellows boots
21. Flush, fill, and bleed power steering system
22. Remove, inspect, replace, and adjust power steering pump belt
23. Remove and reinstall power steering pump
24. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment
25. Inspect and replace power steering hoses and fittings
26. Inspect and replace pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper
27. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps
28. Diagnose, inspect, adjust, repair or replace components of electronically controlled steering systems (including sensors, switches, and actuators); initialize system as required
29. Lubricate suspension and steering systems
   The student will be able to describe complex diagnostics of suspension systems
30. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action
31. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action
32. Test and diagnose components of electronically controlled suspension systems using a scan tool; determine necessary action
   The student will explain perform complex repairs of suspension systems
33. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action
34. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action
35. Remove, inspect, and install upper and lower control arms, bushings, shafts, and rebound bumpers
36. Remove, inspect, and install strut rods and bushings
37. Remove, inspect, and install upper and/or lower ball joints
38. Remove, inspect, and install steering knuckle assemblies
39. Remove, inspect, and install short and long arm suspension system coil springs and spring insulators
40. Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts
41. Remove, inspect, and install stabilizer bar bushings, brackets, and links
42. Remove, inspect, and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount
43. Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts
The student will be able to review pre-alignment inspection and necessary actions

44. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action
45. Perform prealignment inspection and measure vehicle ride height; perform necessary action
46. Prepare vehicle for wheel alignment on the alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber, and toe as required, center steering wheel
47. Check toe-out-on-turns (turning radius); determine necessary action
48. Check SAI (steering axis inclination) and included angle; determine necessary action.
49. Check rear wheel thrust angle; determine necessary action
50. Check for front wheel setback; determine necessary action
51. Check front and/or rear cradle (subframe) alignment; determine necessary action

The student will be able to explain complex repairs of wheel and tire systems

52. Inspect tire condition; identify tire wear patterns, check and adjust air pressure; determine necessary action
53. Rotate tires according to manufacturer’s recommendations
54. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic)
55. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor
56. Reinstall wheel; torque lug nuts
57. Inspect tire and wheel assembly for air loss; perform necessary action
58. Repair tire using internal patch

The student will be able to describe complex diagnostics of wheel and tire systems

59. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action
60. Measure wheel, tire, axle flange, and hub run-out; determine necessary action
61. Diagnose tire pull problems; determine necessary action
62. Inspect, diagnose, and calibrate tire pressure monitoring system

ASSESSMENT OF LEARNER OUTCOMES:
Assessment methods may include, but are not limited to, the following: Homework, Assignments, Quizzes, Class Participation, Chapter Tests, and Final Exam. The grading scale and the process for calculating the course grades are to be determined by the individual instructors. This information will be included in each instructor’s syllabus.

SPECIAL NOTES:
This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.
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Kansas City Kansas Community College offers equal educational opportunity to all students as well as serving as an equal opportunity employer for all personnel. Various laws, including Title IX of the Educational Amendments of 1972, require the college’s policy on non-discrimination be administered without regard to race, color, age, sex, religion, national origin, physical handicap, or veteran status and that such policy be made known.

Kansas City Kansas Community College complies with the Americans with Disabilities Act. If you need accommodations due to a documented disability, please contact the Director of the Academic Resource Center in Room 3354 or call (913) 288-7670 V/TDD.