

**JEFFERSON COLLEGE**

**COURSE SYLLABUS**

**AUT142**

**AUTOMOTIVE STEERING AND SUSPENSION SYSTEMS LAB**

3 Credit Hours

Prepared by: Gerard Uhls

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## AUT142 Automotive Steering and Suspension Systems Lab

### I. CATALOGUE DESCRIPTION

- A. Pre-requisite: AUT100 Automotive Shop Safety; AUT131 Automotive Brake Systems; AUT132 Automotive Brake Systems Lab  
Co-requisite: AUT141 Automotive Steering and Suspension Systems
- B. 3 Credit Hours
- C. Steering and Suspension Systems involves the study of various common suspension systems including: Short/Long Arm, McPherson strut, Modified strut, and electronic suspension systems. Individual components and inspection/replacement will be covered. Steering systems types covered will include: parallelogram steering, rack and pinion, and power assist systems. Two and four wheel alignment, tire wear, and vehicle handling issues will be addressed. Completion of this course will help prepare the student for entry level employment and the National Institute for Automotive Service Excellence (ASE) test (A-4). (F)

### II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

<b>A. General Suspension and Steering Systems Diagnosis</b>		
Demonstrate understanding of identifying and interpreting suspension and steering system concerns		Identify and Interpret Suspension and Steering System Concerns
Demonstrate understanding of researching applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins	P-1	Research Applicable Vehicle and Service Information, Vehicle Service History, Service Precautions, and Technical Service Bulletins
<b>B. Steering Systems Diagnosis and Repair</b>		
Demonstrate understanding of disabling and enabling supplemental restraint system (SRS)	P-1	Disable and Enable Supplemental Restraint System (SRS)
Demonstrate understanding of removing and replacing steering wheel, centering/timing supplemental restraint system (SRS), coil (clock spring)	P-1	Remove and Replace Steering Wheel, Center/Time Supplemental Restraint System (SRS), coil (clock spring)

Demonstrate understanding of diagnosing steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action	P-2	Diagnose Steering Column Noises, Looseness, and Binding Concerns(including tilt mechanisms); determine necessary action
Demonstrate understanding of diagnosing power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns	P-2	Diagnose Power Steering Gear (non-rack and pinion) Binding, Uneven Turning Effort, Looseness, Hard Steering, and Noise Concerns; determine necessary action
Demonstrate understanding of diagnosing power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns	P-2	Diagnose Power Steering Gear (rack and pinion) Binding, Uneven Turning Effort, Looseness, Hard Steering, and Noise Concerns; determine necessary action
Demonstrate understanding of inspecting steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel	P-2	Inspect Steering Shaft Universal-Joint(s), Flexible Coupling(s), Collapsible Column, Lock Cylinder Mechanism, and Steering Wheel; perform necessary action
Demonstrate understanding of removing and replacing rack and pinion steering gear, inspect mounting bushings and brackets	P-2	Remove and Replace Rack and Pinion Steering Gear; Inspect Mounting Bushings and Brackets
Demonstrate understanding of inspecting and replacing rack and pinion steering gear inner tie rod ends (sockets) and bellows boots	P-2	Inspect Rack and Pinion Steering Gear Inner Tie Rod Ends (sockets) and Bellows Boots; replace as needed
Demonstrate understanding of determining proper power steering fluid type, inspecting fluid level and condition	P-1	Determine Proper Power Steering Fluid Type; Inspect Fluid Level and Condition
Demonstrate understanding of flushing, filling, and bleeding power steering system	P-2	Flush, Fill, and Bleed Power Steering System
Demonstrate understanding of diagnosing power steering fluid leakage	P-2	Inspect for Power Steering Fluid Leakage; determine necessary action
Demonstrate understanding of removing, inspecting, replacing, and adjusting power steering pump belt	P-1	Remove, Inspect, Replace, and Adjust Power Steering Pump Drive Belt

Demonstrate understanding of removing and reinstalling power steering pump	P-2	Remove and Reinstall Power Steering Pump
Demonstrate understanding of removing and reinstalling press fit power steering pump pulley, checking pulley and belt alignment	P-2	Remove and Reinstall Press Fit Power Steering Pump Pulley; Check Pulley and Belt Alignment
Demonstrate understanding of inspecting and replacing power steering hoses and fittings	P-2	Inspect and Replace Power Steering Hoses and Fittings
Demonstrate understanding of inspecting and replacing pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper	P-2	Inspect and Replace Pitman Arm, Relay (centerlink/intermediate) Rod, Idler Arm and Mountings, and Linkage Damper.
Demonstrate understanding of inspecting, replacing, and adjusting tie rod ends (sockets), tie rod sleeves, and clamps	P-1	Inspect, Replace, and Adjust Tie Rod Ends (sockets), Tie Rod Sleeves, and Clamps
Demonstrate understanding of identifying hybrid vehicle power steering system electrical circuits and safety precautions.	P-2	Identify Hybrid Vehicle Power Steering Electrical Circuits and Safety Precautions
Demonstrate understanding of inspecting and testing electric power assist steering	P-3	Inspect Electric Power-Assisted Steering

### **C. Suspension Systems Diagnosis and Repair**

Demonstrate understanding of diagnosing short and long arm suspension system noises, body sway, and uneven ride height concerns	P-1	Diagnose Short and Long Arm Suspension System Noises, Body Sway, and Uneven Ride Height Concerns; determine necessary action.
Demonstrate understanding of diagnosing strut suspension system noises, body sway, and uneven ride height concerns	P-1	Diagnose Strut Suspension System Noises, Body Sway, and Uneven Ride Height Concerns; determine necessary action.
Demonstrate understanding of Inspecting removing, and installing upper and lower control arms, bushings, shafts, and rebound bumpers	P-3	Inspect, Remove and Install Upper and Lower Control Arms, Bushings, Shafts, and Rebound Bumpers
Demonstrate understanding of inspecting, removing, and installing upper and/or lower ball joints	P-2	Inspect, Remove and Install Upper and/or Lower ball Joints (with or without wear indicators)
Demonstrate understanding of inspecting removing, and installing steering knuckle assemblies	P-2	Inspect, Remove and Install Steering Knuckle Assemblies

Demonstrate understanding of inspecting, removing, and installing short and long arm suspension system coil springs and spring insulators	P-3	Inspect, Remove and Install Short and Long Arm Suspension System Coil Springs and Spring Insulators
Demonstrate understanding of inspecting, removing, and installing front stabilizer bar (sway bar) bushings, brackets, and links	P-3	Inspect, Remove and Install Front Stabilizer Bar (sway bar) bushings, Brackets, and Links
Demonstrate understanding of Inspecting, removing, and installing strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount	P-3	Inspect, Remove and Install Strut Cartridge or Assembly, Strut Coil Spring, Insulators (Silencers), and Upper Strut Bearing Mount
Demonstrate understanding of inspecting, removing and installing track bar, strut rods/radius arms, and related mounts and bushings	P-3	Inspect, Remove and Install Track Bar, Strut Rods/Radius Arms, and Related Mounts and Bushings
Demonstrate an understanding of inspecting rear suspension system leaf spring(s), bushings, centerpins/bolts,	P-1	Inspect Rear Suspension System Leaf Spring (s), Bushings, Center Pins/Bolts, and Mounts

#### **D. Related Suspension and Steering Service**

Demonstrate understanding of inspecting, removing, and replacing shock absorbers; inspect mounts and bushings	P-1	Inspect, Remove and Replace Shock Absorbers; Inspect Mounts and Bushings.
Demonstrate understanding of removing, inspecting, and servicing or replacing front and rear wheel bearings	P-1	Remove, Inspect and Service or Replace Front and Rear Wheel Bearings
Demonstrate understanding by description the function of the power steering switch	P-3	Describe the Function of the Power Steering Switch
Demonstrate understanding of lubricating suspension and steering systems		Lubricate Front Suspension and Steering Components

#### **E. Wheel Alignment Diagnosis, Adjustment, and Repair**

Demonstrate understanding of diagnosing vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns	P-1	Diagnose Vehicle Wander, Drift, Pull, Hard Steering, Bump Steer, Memory Steer, Torque Steer, and Steering Return Concerns; Determine Necessary Action
Demonstrate understanding of performing pre-alignment inspection and measure vehicle ride height; perform necessary action	P-1	Perform Pre-alignment Inspection and Measure Ride Height; Perform Necessary Action

Demonstrate understanding of preparing vehicle for wheel alignment on the alignment machine, performing four wheel alignment by checking and adjusting front and rear wheel caster, camber, and toe as required, center steering wheel	P-1	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
Demonstrate understanding of checking toe-out-on-turns (turning radius); determine necessary action	P-2	Check Toe Out On Turns (Turning Radius); Determine Necessary Action
Demonstrate understanding of checking SAI (steering axis inclination) and included angle; determine necessary action	P-2	Check SAI (Steering Axis Inclination) and Included Angle; Determine Necessary Action
Demonstrate understanding of checking rear wheel thrust angle; determine necessary action	P-1	Check Rear Wheel Thrust Angle; Determine Necessary Action
Demonstrate understanding of checking for front wheel setback; determine necessary action	P-2	Check for Front Wheel Setback; Determine Necessary Action
Demonstrate understanding of checking front and/or rear cradle (sub-frame) alignment; determine necessary action	P-3	Check Front and/or Rear Cradle (sub-frame) Alignment; Determine Necessary Action
Demonstrate understanding of resetting steering angle sensor	P-2	Reset Steering Angle Sensor

#### **F. Wheel and Tire Diagnosis and Repair**

Demonstrate understanding of inspecting tire condition, identifying tire wear patterns, checking for proper size and application (load and speed ratings) and adjust air pressure; determine necessary action	P-1	Inspect Tire Condition, Identify Tire Wear Patterns, Check for Correct Tire Size and Application (load and speed ratings) and Adjust Air Pressure; Determine Necessary Action
Demonstrate understanding of diagnosing wheel/tire vibration, shimmy, and noise; determine necessary action	P-2	Diagnose Wheel/Tire Vibration, Shimmy, and Noise; Determine Necessary Action
Demonstrate understanding of rotating tires according to manufacturer's recommendations	P-1	Rotate Tires According to Manufacturer's recommendations
Demonstrate understanding of measuring wheel, tire, axle flange, and hub run-out; determine necessary action	P-2	Measure Wheel, Tire, Axle Flange, and Hub Run-out; Determine Necessary Action

Demonstrate understanding of diagnosing tire pull problems; determine necessary action	P-2	Diagnose Tire Pull Problems; Determine Necessary Action
Demonstrate understanding of dismounting, inspecting, and remounting tire on wheel, balance wheel and tire assembly (static and dynamic)	P-1	Dismount, Inspect, and Remount Tire on Wheel; Balance Wheel and Tire Assembly (static and dynamic)
Demonstrate understanding of dismounting, inspecting, and remounting tire on wheel equipped with tire pressure monitoring system sensor	P-2	Dismount, Inspect, and Remount Tire on Wheel Equipped with Tire Pressure Monitoring System Sensor
Demonstrate understanding of inspecting tire and wheel assembly for air loss; perform necessary action	P-1	Inspect Tire and Wheel Assembly for Air Loss; Perform Necessary Action
Demonstrate understanding of repairing tire using internal patch	P-1	Repair Tire Using Internal Patch
Demonstrate understanding of the knowledge of the steps required to remove and replace sensors in a tire pressure monitoring system	P-1	Demonstrate Knowledge of Steps Required to Remove and Replace Sensors in a Tire Pressure Monitoring System
Demonstrate understanding of identifying and testing tire pressure monitoring system (indirect and direct) for operation, verify operation of instrument panel lamps	P-2	Identify and Test Tire Pressure Monitoring System (indirect and direct) for operation, verify operation of instrument panel lamps

### III. OUTLINE OF TOPICS

#### A. Locate Vehicle Information

1. Locate vehicle history in Mitchell Management system
2. Locate correct vehicle information using Mitchell Pro Demand or Alldata
3. Locate technical service bulletins using Mitchell Pro Demand or Alldata
4. Locate vehicle service precautions using Mitchell Pro Demand or Alldata

#### B. Identify Safety and Service for Steering Column Components

1. Perform procedures for disabling/enabling SRS
2. Test steering column components

3. Test the positions of the lock cylinder
  4. Remove and replace steering wheel
  5. Inspect steering column for looseness, binding, uneven effort and hard steering
- C. Inspect Steering Systems
1. Identify different types of steering and suspension systems
  2. Test rack and pinion and non-rack and pinion steering components
  3. Inspect power steering system for proper operation and leaks
  4. Check power steering belt condition and adjustment
  5. Identify electronic steering components
- D. Related Steering and Suspension Service
1. Service front and rear wheel bearings to include preload adjustments
  2. Lubricate front and rear suspension components
  3. Remove and replace McPherson strut and shock absorbers
- E. Perform Wheel Alignment
1. Perform prealignment inspection on live vehicle
  2. Measure and adjust front camber, caster and toe and rear camber and toe
  3. Measure thrust line on live vehicle
  4. Measure SAI, included angle and toe-out-on-turns
  5. Test drive vehicle
- F. Perform Tire and Wheel Service
1. Inspect tire for out of round, pulling concerns and out of balance
  2. Check and adjust tire pressure
  3. Mount and dismount tire with and without TPMS
  4. Repair tire according to manufacturer's procedures

#### IV. METHOD(S) OF INSTRUCTION

- A. Demonstrations
- B. Shop Exercises
- C. Lab Exercises
- D. Small Group Projects
- E. Live Vehicle Repair



V. REQUIRED TEXTBOOK(S)

James D. Halderman, Chase D. Mitchell, *Automotive Chassis Systems NATEF Correlated task Sheets*, (current edition), Pearson

VI. REQUIRED MATERIALS

- A. Jefferson College Automotive Technology Shirt (2)
- B. Safety Glasses (Clear)
- C. Shop Boots (Steel Toe Preferred)

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHOD OF EVALUATION

- A. Lab Sheets (NATEF Competencies) 50%
- B. Technician Supplemental Tasks 50%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College Website <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College

Catalog or a Student Financial Services representative for more details.

## XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.