

**I. CATALOG DESCRIPTION:**

A. Department Information:

Division: Technical  
Department: Automotive  
Course ID: AUTO 053  
Course Title: Advanced Automotive Suspension and Steering  
Units: 4  
Lecture: 3 Hours  
Laboratory: 3 Hours  
Prerequisite: AUTO 052

B. Catalog and Schedule Description:

This course is designed for students and current technicians to gain advanced knowledge and skills in automotive chassis and suspension systems. Included but not limited to suspension design, advanced geometry, alignment angles, four-wheel alignment using computerized methods. Emphasis on diagnosing, trouble-shooting, repairing, replacing, and adjusting. Advanced theory and practical work in the repair of chassis and suspension systems. Shop instruction to include safety, rebuilding, replacing, and alignment procedures for trouble shooting of suspension systems.

C. Schedule Description:

Advanced theory and practical work in the repair of chassis and suspension systems. Shop instruction to include safety, rebuilding, replacing, and alignment procedures for trouble shooting of suspension systems.

**II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One**

**III. EXPECTED OUTCOMES FOR STUDENTS:**

Upon completion of the course the student should be able to:

- A. Solve complex steering systems malfunctions;
- B. Analyze differing suspension system problems;
- C. Calculate corrected angles for optimum high performance handling characteristics;
- D. Demonstrate competencies in diagnosing unique problems with tire and wheel assemblies.

**IV. COURSE CONTENT:**

- A. Shop safety
  1. Hazardous materials
  2. Material Safety Data Safety Sheets
  3. Machinery Hazards
- B. Shop techniques
  1. Tools
  2. Torque
  3. Fasteners
  4. Brake tube bending and flaring
- C. Chassis design: Styles of frames
  1. Unitized body
  2. Space frame
  3. Full frames
- D. Rolling members
  1. Tires
    - a) Service description
    - b) DOT tire codes

- c) Wheels
- d) Construction and materials
- e) Proper mounting and tightening
- 2. Tire/Wheel assemblies
  - a) Inspection
  - b) Radial run out
  - c) Lateral run out
  - d) Tire mounting
  - e) Tire repair
  - f) Tire balancing
- E. Drive train
  - 1. Rear wheel drive
    - a) U-joint design and operation
    - b) Measuring drive shaft angles
    - c) Drive shaft and universal joint inspection
    - d) Universal joint replacement
  - 2. Front wheel drive
    - a) Constant velocity joint (C/V) design and operation
    - b) C/V joint maintenance
    - c) C/V joint diagnosis and replacement
- F. Steering systems
  - 1. Manual steering
    - a) Steering linkage components
    - b) Inspection
    - c) Parts replacement and service
  - 2. Power steering
    - a) Steering linkage components
    - b) Inspection
    - c) Parts replacement and service
    - d) Hydraulic components/pumps
  - 3. Rack and pinion steering
    - a) Steering linkage components
    - b) Inspection
    - c) Parts and service
    - d) Power rack and pinion steering
- G. Suspensions systems
  - 1. Suspension principles
  - 2. Types of energy absorbers
    - a) Coil springs
    - b) Leaf springs
    - c) Torsion bars
    - d) Air suspension
    - e) Shock absorbers
  - 3. Types of suspensions
    - a) Short Long Arm (SLA)
    - b) McPherson strut
    - c) Modified McPherson strut
    - d) Single I-Beam
    - e) Twin I-Beam
    - f) Electronically controlled system
    - g) Rear suspensions
  - 4. Suspension inspection and diagnosis
    - a) Ball joint
    - b) Bump stops
    - c) Struts/stocks
    - d) Springs

- e) Bushings
- f) Sway bar
- H. Wheel alignment
  - 1. Alignment principles
    - a) Camber
    - b) Caster
    - c) Toe
    - d) Steering axis inclination (SIA)
    - e) Included Angle
    - f) Scrub radius
    - g) Turning radius
    - h) Setback
    - i) Thrust angle
    - j) Tracking
    - k) Reading alignment specifications
  - 2. Types of alignments
    - a) Geometric centerline
    - b) Thrust line
    - c) Total four wheel alignment
  - 3. Computer type alignments
    - a) Setup procedures
    - b) Measuring angles
    - c) Checking for bent components
    - d) Adjusting front alignment angles
    - e) Adjusting rear alignment angles

**V. METHODS OF INSTRUCTION:**

- A. Lecture
- B. Read text book and service manuals
- C. Class and group discussion
- D. Manufacturers video instructions
- E. Lab demonstrations

**VI. TYPICAL ASSIGNMENTS:**

- A. Read assigned chapters and answer questions at the end of each chapter  
Typical Question:  
Explain the procedures for flushing a power steering system.
- B. Class discussion: Typical Topic:  
What is a dry park test and how is it performed?
- C. Review videotape and write overview of the presentation.
- D. Lab Assignments: Complete advanced task sheets as per instructor  
Typical assignments: Check analytic alignment angles in front of suspension

**VII. EVALUATION(S):**

- A. Methods of evaluation:
  - 1. Review questions and quizzes
  - 2. Mid-term examination
  - 3. Final examination: Typical Question:
    - a) Describe the purpose of the stabilizer bar.
    - b) List the 10 pre-alignment checks that should be performed before the wheel alignment is checked.
  - 4. Assigned advanced lab projects
  - 5. Writing assignments: Analyze failed components and write an analytic report.
- B. Frequency of evaluation:

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1. One mid-term examination
  2. One final examination
  3. Lab projects
  4. Weekly essay questions
  5. Four lecture related quizzes
- C. Levels of evaluation:
1. Upon completion the student will be able to: Typical Question:
    - a) Steer Linkage: Explain how a tapered part is removed from linkage  
Lab Assignment: Disassemble a Saginal power steering gearbox, inspect and reassemble to OEM specifications
    - b) Suspension system: List four symptoms of worn shock absorbers  
Lab Assignment: Completely assemble an automobile suspension returning all components to OEM standards
    - c) Wheel alignment: What are the symptoms of misalignment?  
Lab Assignment: Reset then alignment angles to compensate fro modifications or wear using other than factory standards
    - d) Wheel and tire: Explain the difference between dynamic and static balance  
Lab Assignment: Dismount, inspect, remount high, and dynamically balance high performance tires

**VIII. TYPICAL TEXT(S):**

Halderman, James D., Automotive Steering, Suspension, and Wheel Alignment, 2<sup>nd</sup> Edition, Columbus, Ohio: Prentice Hall 2000  
Don Knowles, Automotive Steering and Suspension, 3<sup>rd</sup> Edition, Albany, New York: Delmar Publishers 2003

**IX. OTHER SUPPLIES REQUIRED OF STUDENTS:**

Personal safety gear to include safety glasses, adequate works clothes and shoes providing proper personal protection.