

I. CATALOG DESCRIPTION:

- A. Department Information:
Division: Technical
Department: Automotive
Course ID: AUTO 052
Course Title: Automotive Suspension and Steering
Units: 4
Lecture: 3 Hours
Laboratory: 3 Hours
Prerequisite: None
- B. Catalog Description:
This course is based upon NATEF standards and designed for students and current technicians to gain knowledge and skills in automotive chassis and suspension systems. Included but not limited to suspension types, basic geometry, alignment angles, two wheel alignment and four-wheel alignment using both computerized and mechanical methods. Emphasis on diagnosing, troubleshooting, repairing, replacing, and adjusting. This course may be used in preparation for the Automotive Service Excellence (ASE) National Test. 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. This course may be used in preparation for the Automotive Service Excellence (ASE) National Test (A-4).
- C. Schedule Description:
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. (ASE) National Test (A-4) applicable.

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. Evaluate the condition of Steering Systems and summarize the necessary repairs;
- B. Identify problems with Suspension Systems;
- C. Examine a vehicle for proper alignment geometry;
- D. Demonstrate proficiency in balancing tire and wheel assemblies;
- E. Apply knowledge and skills attained to pass the Automotive Service Excellence (ASE) national test from automobile brakes A-4 and complete task sheets per NATEF Standards.

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
 1. Styles of frames
 - a) Unitized body
 - b) Space frame
 - c) 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
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- 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 and replacement service
 - 2. Power steering
 - a) Steering linkage components
 - b) Inspection
 - c) Parts and 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. Suspension 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. Manufacturer's video instructions
- E. Lab demonstrations

VI. TYPICAL ASSIGNMENTS:

- A. Read test book: Answer questions at end of each chapter: Example: List the types of suspensions and their component parts
- B. Class discussion (Typical): What are the cause and effects of improper alignment angles?
- C. Manufacturers instruction: Review video tape and write overview of presentation
- D. Lab Assignments:
 - 1. Complete task sheets as per NATEF standards, from workshop textbook (Examples)
 - a) Replace McPherson struts and align front end
 - b) Write a work order detailing customers needs
 - c) Evaluate a customers vehicle and prepare an accurate cost of repairs

VII. EVALUATION(S):

- A. One midterm and final examination
 - 1. Multiple choice, True/false and essay questions: Typical Questions:
 - a) What makes a constant velocity joint able to transmit engine power through an angle at a constant speed?
 - b) List the steps for a proper four-wheel alignment
- B. Chapter review questions (Example): What is the most serious tire wearing angle?
- C. Assigned lab projects as per NATEF standards
- D. Communication: Writing Assignments: Compose a work order detailing customers requests
- E. Frequency of evaluation
 - 1. One midterm evaluation
 - 2. One final examination
 - 3. Lab projects as per NATEF standards
 - 4. Weekly textbook chapter review questions
 - 5. Four lecture related quizzes
- F. Levels of evaluation

1. Students are expected to:
 - a) Recognize steering linkage and name the components: Typical Question: Sketch a parallelogram system and identify parts
 - b) Lab Assignment: Complete NATEF Tasks a-1 through A-21
 - c) Suspension system: Typical Questions: What tools should be used to change a ball joint?
 - d) Appraise the condition of a worn suspension and calculate cost of repairs
 - e) Lab assignment: Complete NATEF Tasks as follows:
 - i) Front B-1.1 through B-1.11,2.4
 - ii) Rear B-2.1 through B-2.3
 - iii) Miscellaneous Service B-3.1 through B-3.3
 - f) Wheel alignment: Typical Question: Why is a 4-wheel alignment a cut above a 2-wheel?
 - g) Lab Assignment: Complete NATEF tasks C-1 through C-13
 - h) Wheel and Tire: Typical question: What does the "185" mean on a 185/75-14 tire?
 - i) Lab Assignment: Complete NATEF tasks D-1 through D-8

VIII. TYPICAL TEXT(S):

Check Chart Publications, Automotive Steering, Suspension, & Wheel Alignment (3rd Edition), Columbus, Ohio: Prentice Hall 2000.

Halderman James D., Automotive Chassis Systems (2nd Edition), Columbus, Ohio: Prentice Hall 2000.

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

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