



COURSE OUTLINE

Course Number AUT 113	Course Title Suspension, Steering, and Alignment	Credits 4
Hours: 2 / 4	Co- or Pre-requisite AUT 110 and AUT 111	Implementation sem/year Spring 2019

Catalog description (2018-2019 Catalog): Theory of operation and service of vehicular suspension and steering systems, with emphasis on component inspection and replacement. Addresses four-wheel alignment with lab activities using a drive-on alignment rack and computer alignment machine.

Is course New, Revised, or Modified? Revised

Required texts/other materials: Halderman, James D., **Automotive Steering, Suspension, and Alignment, (current edition), Pearson Education, 2017**

Revision date: January 2019
Course coordinator Jason Evans, Ext. 3776, evansj@mccc.edu

Information resources: DealerConnect web-site, Chrysler Learning Center Training Reference Books, Service Manuals, Subaru of America resources, On-line and CD Disc Self-study Courses and the AllData Online Service Information Database.

Other learning resources: ASE Study Guides, Automotive Related Articles Obtained From Magazines and Journals

Course Competencies/Goals:

The student will be able to:

- demonstrate his/her knowledge of principles, terminology, theories of operation, and service procedures regarding automotive steering and suspension systems..
- analyze automotive steering and suspension systems through inspection processes and road testing procedures.
- demonstrate proper component replacement and adjustment to restore system operation and ensure customer safety.
- explain the operation power steering pumps and different steering gear designs.
- demonstrate his/her ability to accurately diagnose customer concerns related to steering, suspension, and wheel alignment.
- explain differences between different steering and suspension designs, including advantages and disadvantages of each.

Course-specific General Education Knowledge Goals and Core Skills.

General Education Knowledge Goals

Goal 1. Communication. Students will communicate effectively in both speech and writing.

Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Goal 5. History. Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

Goal 6. Ethical Reasoning and Action. Students will understand ethical issues and situations.

MCCC Core Skills

Goal A. Written and Oral Communication in English. Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

Goal B. Critical Thinking and Problem-solving. Students will use critical thinking and problem solving skills in analyzing information.

Goal C. Ethical Decision-Making. Students will recognize, analyze and assess ethical issues and situations.

Goal D. Information Literacy. Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Goal E. Computer Literacy. Students will use computers to access, analyze or present information, solve problems, and communicate with others.

Goal F. Collaboration and Cooperation. Students will develop the interpersonal skills required for effective performance in group situations.

Goal G. Intra-Cultural and Inter-Cultural Responsibility. Students will demonstrate an awareness of the responsibilities of intelligent citizenship in a diverse and pluralistic society, and will demonstrate cultural, global, and environmental awareness.

Unit I INTRODUCTION TO STEERING, SUSPENSION, AND ALIGNMENT

Learning Objectives

The student will be able to...

- provide basic identification of steering and suspension components
- explain how steering and suspension systems work together
- identify steering and suspension components that are in need of service
- examine tire wear patterns to determine wheel alignment concerns

- A. Introduction
 - a. Steering Systems
 - b. Suspension Systems
 - c. Wheel Alignment
 - d. Wheel Balance

Unit II SUSPENSION SYSTEMS

Learning Objectives

The student will be able to...

- describe the design differences between different suspension systems
- explain the function and necessity of each suspension component
- identify symptoms related to suspension system malfunctions
- perform repair of suspension systems by following proper repair techniques

- A. Front Suspension Systems
 - a. Torsion Bar
 - i. Description
 - ii. Operation
 - iii. Service
 - b. Coil Spring
 - i. Description
 - ii. Operation
 - iii. Service
 - c. MacPherson Strut
 - i. Description
 - ii. Operation
 - iii. Service
 - d. Anti-Sway Bar
 - i. Description
 - ii. Operation
 - iii. Service
 - e. Inspection and Maintenance of Front Suspension Systems
- B. Rear Suspension Systems
 - a. Leaf Spring
 - i. Description
 - ii. Operation
 - iii. Service
 - b. Semi-Independent / Independent Systems
 - i. Description
 - ii. Operation
 - iii. Service

- C. Shock Absorbers / Struts
 - a. Description
 - b. Operation
 - c. Service

- D. Air Suspension Systems
 - a. Description of System
 - b. Operation of System
 - c. Trouble Shooting and Diagnosis
 - d. Service and Repair

- E. Wheels, Tires, and Wheel Bearings
 - a. Description of Wheels
 - i. Construction
 - ii. Design
 - iii. Service
 - b. Description of Tires
 - i. Construction
 - ii. Design
 - iii. TPMS – Tire Pressure Monitoring System
 - 1. Government Regulation
 - 2. System Design
 - a. Sensor Types
 - 3. Operation
 - 4. Diagnosis
 - 5. Service
 - iv. Mounting Procedure
 - 1. Indexing Tires
 - c. Wheel Balance
 - i. Fundamentals of Wheel Balance
 - 1. Dynamic
 - 2. Static
 - ii. Wheel Balancer Types
 - 1. Computer Spin-Balancer
 - 2. Semi-Automatic Balancer
 - 3. Bubble Balancer
 - iii. Diagnosis of Wheel and Tire Balance and Run-out
 - iv. Service of Wheel and Tire Balance and Run-out
 - v. Match Mounting to Correct Wheel Balance
 - d. Wheel Bearings
 - i. Types
 - 1. Description
 - 2. Operation
 - ii. Maintenance and Inspection
 - iii. Wheel Bearing Service

Unit III STEERING SYSTEMS

Learning Objectives

The student will be able to...

- describe the design differences between steering systems
- explain the function and necessity of each steering system component
- identify symptoms related to steering system malfunctions
- perform repair of steering systems by following proper repair techniques

- A. Linkage Steering System
 - a. Description
 - b. Operation
 - i. Manual
 - ii. Power Assist
 - c. Inspection and Maintenance

- B. External-Ram Steering System
 - a. Description
 - b. Operation
 - i. Power Assist
 - c. Inspection and Maintenance

- C. Rack and Pinion Steering Systems
 - a. Description
 - b. Operation
 - i. Manual
 - ii. Power Assist
 - c. Inspection and Maintenance

- D. Steering Gearbox Power Steering System
 - a. Description
 - i. Re-circulating Ball Type
 - b. Operation
 - i. Manual
 - ii. Power Assist
 - c. Inspection and Maintenance

- E. Hydraulic Principals
 - a. Fluids
 - b. Pressure Balance and Imbalance
 - c. Control Valves
 - i. Spool Valve
 - ii. Rotary Valve

- F. Power Steering Pumps
 - a. Description
 - b. Operation
 - i. Power Steering Pressure Sensors
 - ii. Pressure Relief Valves
 - c. Inspection and Maintenance
 - d. Fluid Leak Diagnosis

- G. Constant Velocity Joints
 - a. Description
 - b. Operation
 - c. Inspection and Maintenance

Unit IV WHEEL ALIGNMENT

Learning Objectives

The student will be able to...

- describe the function of all wheel alignment angle settings
- explain the effects of improper alignment angle settings
- identify symptoms related to wheel misalignment
- perform 4-wheel alignment on a passenger vehicle using a computerized alignment machine

- A. Wheel Alignment
 - a. Wheel Alignment Fundamentals
 - i. Caster
 - 1. Use in Correcting For Road Crown
 - ii. Camber
 - iii. Toe
 - iv. Steering Axis Inclination (SAI)
 - v. Toe-Out On Turns (Turning Radius)
 - vi. Thrust Angle (Tracking)
 - b. Diagnosis
 - c. Service procedure
- B. Diagnostic Checks
 - a. Introduction
 - b. Wander or Directional Stability Check
 - c. Lateral Pull or Lead
 - d. Vibration, Shake, or Shimmy
 - e. Steering Wheel Return to Center
 - f. Low Speed Wobble
 - g. Tire Wear Patterns
 - i. Reading Tire Wear

Unit V COURSE REVIEW / Final Exam

- A. Introduction to Steering, Suspension, and Alignment
- B. Suspension Systems
- C. Steering Systems
- D. Wheel Alignment

Evaluation of student learning:

- | | |
|---|-----|
| A. Lab Work | 50% |
| B. Test/Quizzes/Homework Assignments/Final Exam | 50% |

Academic Integrity Statement:

Mercer County Community College is committed to Academic Integrity-- the honest, fair and continuing pursuit of knowledge, free from fraud or deception. This implies that students are expected to be responsible for their own work, and that faculty and academic support services staff members will take reasonable precautions to prevent the opportunity for academic dishonesty.

Reasonable Accommodations for Students with Documented Disabilities

Mercer County Community College is committed to ensuring the full participation of all students in all activities, programs and services. If you have a documented differing ability or think that you may have a differing ability that is protected under the ADA and Section 504 of the Rehabilitation Act, please contact Arlene Stinson in LB 216 stinsona@mccc.edu for information regarding support services. If you do not have a documented differing ability, remember that other resources are available to all students on campus including academic support through our Academic Learning Center located in LB 214.