AUME-770: AUTOMOTIVE SUSPENSION, STEERING AND ALIGNMENT SYSTEMS

Effective Term
Fall 2026

BOT Approval Date
12/11/2025

Discipline
AUME - Automotive/Transportation Tech
Course Number
770

Course Title
Automotive Suspension, Steering and Alignment Systems

Short Title
Auto Suspension/Steering

Credit Status (CB 04)
D - Credit - Degree applicable

Units

Lecture Units
3.00

Lab Units
1.00

Total Units
4.00

Hours

Lecture Contact Hours
48-54
Out of Class Hours Lecture
96-108

Lab Contact Hours
48-54
Out of Class Hours Lab
0.00

Total Contact Hours
96 - 108

Total Out of Class Hours
96 - 108

Total Student Learning Hours
192 - 216

Is this an existing Extensive Lab?
No

Do you want to propose this for Extensive Lab?

Yes

Distance Education

No

Catalog Description

This course covers the design, principles of operation, diagnosis, repair and alignment of suspension and steering systems used on passenger vehicles and light trucks. The experience gained in this course is intended to prepare the student to successfully take and pass the ASE A4 Steering and Suspension Technician's Official Certification Exam and provide the knowledge and skills required for entry level employment as an automotive steering, suspension and alignment technician.

Requisites

Recommended Preparation

Recommended Preparation (note that students can enroll in the class even if they haven't take the recommended course)
AUME-700 or previous high school introductory automotive course.

Codes

TOP Code (CB 03)

0948.00* - *Automotive Technology

CIP Code

47.0604 - Automobile/Automotive Mechanics Technology/Technician.

Repeatability Code

No

Grading Option

Letter grade OR P/NP

Minimum Qualifications

Minimum Qualifications	And/Or
Automotive Technology	End

Learning Objectives

Learning Objectives

Learning Objective
1. Analyze safety and environmental hazards common to the automotive service and repair industry.
2. Display the ability to use of specialized automotive service tools and equipment.
3. Compare and contrast various types of vehicle construction and different suspension and steering system types.
4. Evaluate the condition of automotive steering, suspension, tire and wheel systems using industry standard equipment.
5. Display the ability to diagnose and repair problems with an automotive steering column.
6. Prepare a vehicle for a four-wheel alignment and restore the alignment angles to factory specification.
7. Develop and exhibit the use of skills necessary to obtain an entry level position as an automotive suspension and alignment repair technician.
8. Detect electronic steering and suspension system problems using a diagnostic scan tool.
9. Display the ability to retrieve vehicle identification and service information from an online or electronic automotive repair database.
10. Examine the opportunities provided by automotive service companies for veterans to transition to civilian life.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome
1. Students will diagnose and repair suspension system problems on a vehicle or trainer unit.
2. Students will diagnose and repair steering system problems on a vehicle or trainer unit.
3. Students will perform a complete four-wheel alignment procedure according to industry standards.
4. Students will evaluate opportunities in the automotive industry that support career development, such as programs designed for veterans transitioning to civilian life.

Content

Course Lecture Content

1. Course Introduction
    a. Career Paths in the Automotive Repair Industry
    b. Special Opportunities Provided to Military Veterans Wishing to Make the Transition to Civilian Life
    c. The Value of ASE Certification
2. General Suspension and Steering Principles
    a. Review of Safety Precautions and Procedures
        i. S/P2 Hazardous Pollution Prevention Certification
        ii. S/P2 Automotive Service Safety Certification
        iii. ALI "Lifting It Right" Certification
    b. Research Vehicle Information
        i. Alldata Navigation
        ii. Mitchell ProDemand Navigation
    c. Steering System Type Component Identification
    d. Suspension System Component Identification
3. Steering Systems
    a. Steering Columns
        i. Supplemental Inflatable Restraint Systems
            1. Disarming/Rearming Techniques
    b. Steering Linkage Types
        i. Rack and Pinion Type
        ii. Conventional (Parallelogram) Type
        iii. Haltenberger Type
        iv. Cross-Steer Type
        v. Steering Gear Types
            1. Recirculating Ball Type
            2. Rack and Pinion Type
        vi. Power Assisted Steering Types
            1. Hydraulically Assisted
            2. Electric Power Assisted Steering (EPAS)
4. Suspension Systems
    a. Front Suspension Systems
        i. Short-Arm/Long-Arm (SLA) Type
        ii. MacPherson Strut Type
        iii. Multi-Link Type
    b. Rear Suspension Systems
        i. Non-Independent
        ii. Semi-Independent
        iii. Independent
            1. MacPherson Strut Type
            2. Short-Arm/Long-Arm (SLA) Type
            3. Multi-Link Type
5. Related Systems

a. Suspension Dampers
    i. Telescopic Shock Absorbers
    ii. MacPherson Struts
b. Wheel Bearings and Seals
    i. Tapered Roller Bearings
    ii. Sealed Hub/Bearing Assemblies
c. Electronic Suspension Systems
    i. Electronic Level Control
    ii. Active Suspensions
    iii. Electronic Stability Control (ESC)

6. Wheel Alignment Principles
    a. Wheel Alignment Angles
        i. Primary Angles
            1. Camber
            2. Caster
            3. Toe
            4. Thrust
        ii. Secondary Angles
            1. Steering Axis Inclination (SAI)
            2. Included Angle
            3. Scrub Radius
            4. Setback
            5. Track
            6. Toe-Out-On-Turns (TOOT) or Turning Radius
        iii. Advanced Driver Assist System (ADAS) Precautions
7. Tire and Wheel Principles
    a. Dismount/Mounting Techniques
        i. Tire Pressure Monitor System (TPMS) Precautions
        ii. TPMS Reset Procedures
    b. Tire Inspection
        i. Age Determination Techniques
        ii. Wear Pattern Analysis
        iii. Inflation Principles and Techniques
    c. Tire Balance Techniques
        i. Conventional Tire Balance
        ii. Road Force Balance

Course Lab Content

1. General Suspension and Steering Procedures
    a. Retrieve Chassis System On-Board Diagnostic Trouble Codes (DTCs)
    b. Disable and Reenable the Supplemental Inflatable Restraint (SIR) System
    c. Identify Customer Suspension and Steering System Concerns
2. Steering System Service
    a. Hydraulic Assist System Service
        i. Inspect Fluid Level and Condition
        ii. Inspect Pressure and Check for Leaks
        iii. Inspect the Accessory Belt Drive System (ABDS)
    b. Inspect and Test the Electric Power Steering Assist (EPAS) System
        i. Perform Visual Inspections
        ii. Retrieve DTCs and Scan Tool Live Data
    c. Replace Steering Linkage Components
        i. Pitman and Idler Arms
        ii. Center Links
        iii. Inner and Outer Tie Rods
    d. Steering Column Service
        i. Remove/Replace the Steering Wheel
        ii. Replace the Clock-Spring or Coil

e. Diagnose Customer Steering System Concerns
    i. Conventional (Parallelogram) Steering Concerns
    ii. Rack and Pinion Steering Concerns
3. Suspension System Service
    a. Front Suspension Component Removal and Replacement
        i. Control Arms
        ii. Track Bars
        iii. Stabilizer Bars, Bushings and Links
        iv. Ball Joints and Bushings
        v. Coil Springs
        vi. Torsion Bar Replacement and Adjustment
        vii. Knuckle Replacement
    b. Rear Suspension Component Removal and Replacement
        i. Track Bars and Bushings
        ii. Leaf Springs
        iii. Torsion Beam Replacement
        iv. Stabilizer Bar Replacement
    c. Diagnose Customer Suspension Concerns
        i. Body Sway
        ii. Noise, Vibration and Harshness (NVH) Concerns
4. Service of Related Systems
    a. Service Tapered Roller Bearings (TRB) and Grease Seals
    b. Remove and Replace Sealed Hub/Bearing Assemblies
    c. Remove and Replace Shock Absorbers
5. Wheel Alignment Practices
    a. Determine ADAS Recalibration Requirements
    b. Verify Proper Vehicle Ride Height and Tire Pressure
    c. Inspect and Adjust Primary (Adjustable) Wheel Alignment Angles as Necessary
        i. Camber (Rear and Front)
        ii. Caster
        iii. Thrust (Rear Toe)
        iv. Front Toe
    d. Inspect Secondary (Diagnostic) Wheel Alignment Angles and Recommend Necessary Repairs
        i. Setback
        ii. Turning Radius (TOOT)
        iii. Track
        iv. Steering Axis Inclination (SAI)
        v. Included Angle (IA)
    e. Preparation for the Final Performance Examination
        i. Intention is to Augment Equity in Student Assessment
        ii. Requirements of the Final Performance Examination
            1. Preparation and Performance of the Four-Wheel Alignment Procedure
            2. Analysis of the Results
            3. Preparing the Documentation
6. Tire and Wheel Service
    a. Inspect Tire Condition and Age
    b. Interpret Tire Tread Wear Patterns
    c. Perform Tire Dismount and Mounting Procedures
    d. Diagnose and Repair Tire Punctures According to Rubber Manufacturer's Association (RMA) Standards
    e. Perform Tire Rotation Procedures
        i. Rotate Tires
        ii. Perform Tire Pressure Monitor System (TPMS) Relearn Procedure
    f. Perform Force Matching Procedure
    g. Perform Road Force Balance
    h. Measure Tire and Wheel Runout

i. Lateral Runout
ii. Axial Runout

i. Diagnose Tire Pull Problems and Repair as Necessary

Methods of Instruction

Method

Lecture

Integration

Classroom lectures will provide the student with their initial exposure to the concepts related to the course, such as knowledge of the various wheel alignment angles that need to be inspected or adjusted on a modern vehicle. The lectures will be augmented through accessible Slide deck presentations and the display of actual steering and suspension system components.

Method

Lab Activities

Integration

Students will be required to work in teams of three or four students to complete the tasks for the A4 Suspension and Steering area required by the department's third-party accreditation body, the ASEEF. Workplace professionalism and the ability to perform the tasks within the time periods allotted by generally accepted industry standards will be stressed.
The lab activities will include preparation for the final performance exam; this is intended to maximize student equity for those who possess any of the four major learning styles and augment the probability of success for every student.

Method

Role Playing/Simulation

Integration

Students will be asked to perform a mock or practice customer interview, the purpose of which is to successfully interpret an actual or simulated customer complaint involving a suspension or steering system issue.

Method

Observation and Demonstration

Integration

The instructor of the course will demonstrate the various procedures that the students are required to perform as part of their coursework; for example, the instructor would first demonstrate the set-up and performance of a four-wheel alignment procedure using industry-standard equipment.

Methods of Evaluation

Method

Exams/Tests

Integration

Quizzes and tests, including a written midterm and final exam, will be used by the instructor to assess the student's understanding of steering and suspension system operation according to the textbook publisher's answer key. For all quizzes and tests except for the final exam, multiple attempts are allowed and encouraged.

Method

Final Performance

Integration

Students will be required to perform a four-wheel alignment check and interpret the readings obtained. The students interpretation will be compared to an industry standard list of common symptoms provided by the alignment machine manufacturer and assessment will be made according to the speed and accuracy of the student's work as well as the work professionalism exhibited by the student. This Method of Evaluation is intended to maximize student equity by providing an assessment that students possessing any of the four standard learning styles can achieve proficiency with.

Method

Simulation

Integration

Students will be asked to diagnose a steering or suspension problem on a bugged vehicle or trainer unit. Student performance will be assessed according to the accuracy of the student's diagnosis and their ability to perform the required task within the time period allotted to it by generally accepted industry standards.

Method

Class Participation

Integration

Students will be required to perform much of the work required for this course, especially the lab activities, in teams of three or four students. Student performance will be assessed according to the amount of participation that the individual student has contributed to the team, either by researching vehicle repair information, preparation of the required documentation, or actual performance of the task involved.
For example, during the course of performing a wheel alignment check, one student might be engaged in researching the manufacturer specifications for the vehicle, another student or students may be occupied in performing the physical task of preparing and using the alignment equipment, while another has the primary responsibility of documenting the performance of the task; each student will receive credit based on the efficacy of the contribution they are asked to make.

Assignments

Assignment Type

Reading

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Read Chapters 16 and 17 in Auto Steering and Suspension, which cover wheel alignment principles and procedures and be prepared to discuss the relationship between the vehicle thrust angle, its tendency to "dog-track", and the position of the steering wheel spokes as the car is being driven.

Assignment Type

Writing

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment
Prepare a written report for an actual or simulated customer explaining the conformity of their vehicle's alignment readings to manufacturer specifications and list the issues with vehicle handling, tire life and fuel economy that the readings you obtained might cause.

Assignment Type
Other

In-class and/or outside of class
In-class

Formative or Summative
Formative

Assignment
Perform the replacement of a defective steering or suspension system component on a bugged vehicle or specialized steering and suspension trainer unit. The repair should be performed in a professional manner and]within the time allotted by generally accepted industry standards.

Assignment Type
Other

In-class and/or outside of class
In-class

Formative or Summative
Summative

Assignment
Perform a four-wheel alignment procedure and document the issues identified on a bugged vehicle; these issues should include the effects that the defects will have on vehicle handling, tire wear and fuel economy. This assignment represents a final performance examination designed to ensure equity in the assessment of overall student performance.

Assignment Type
Other

In-class and/or outside of class
In-class

Formative or Summative
Formative

Assignment
Participate in a class discussion on the positive effects of opening up entry-level automotive service career paths to the economically disadvantaged in both urban and rural communities across the United States.

Course Materials

Textbooks
Johanson, Chris (2025) Auto Suspension and Steering, 6th Edition. Goodheart and Willcox, ISBN: 979-88-911801-3-0

Other Resources

ALLDATA Online Automotive Repair Data
Mitchell ProDemand Online Automotive Repair Data

Class Size Information

Class Size

24

Class Size Category

J - Specialty lab

Diversity and Inclusion

Course Design and Materials: Course will incorporate diverse perspectives, authors, and examples that reflect a variety of cultures, identities, and lived experiences. Instructional materials will be reviewed regularly to ensure representation, inclusivity, and alignment with equity-minded practices across disciplines.

Inclusive Learning Environment: Instructors will establish classroom norms and policies that promote respect, civil discourse, and belonging in both online and face-to-face classes. Clear expectations for communication and engagement will support a learning space where all students feel valued and heard.

Accessible Instruction: Course content will be delivered using accessible design. Materials will follow accessibility guidelines within the CMS, including captioned media, readable document formats, and multiple means of engagement to support diverse learning.

Equitable Teaching Practices: Instructors will use transparent and grading criteria, varied assessment methods, and timely feedback to promote fairness and student success. Opportunities for revision, reflection, and multiple demonstrations of learning may be incorporated when appropriate to the discipline.

Culturally Responsive Pedagogies: Instructional strategies will encourage critical thinking about diverse perspectives and systems of power relevant to the course content. Faculty will foster opportunities for students to connect course material to real-world contexts.

Ongoing Reflection and Improvement: Faculty will engage in continuous professional development related to IDEAA principles and reflect on course practices using metacognition to identify opportunities for increased equity, inclusion, and accessibility.

Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.

This course is especially suited to military veterans making the transition to civilian life; the transferable skills, a strong work ethic, and discipline displayed by the veteran make the individual an ideal candidate for an entry-level position into the automotive repair industry. The specialized training that this course provides represents the traditional "first rung" on the ladder of skills required for success in that industry. Many accomplished professional technicians began their careers performing tire service and wheel alignment procedures; those tasks are basic and straightforward but still provide a clear path to the acquisition of more lucrative skills such as programming electronic control modules (This is done as a part of the TPMS Relearn procedure) and the analysis of complex active suspension and stability control system operation.
Many companies, such as AutoNation, Audi, Midas, and Caliber Collision Centers, offer veterans career paths and do their best to support the veteran's transition to civilian life. The automotive department maintains an online certification program with Audi, which will allow for their initial entry into this path; this advantage is showcased as a part of this course which generally benefits from a high proportion of veteran enrollment.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.

The coursework required for success in this course represents a combination of theoretical knowledge and the ability to demonstrate the possession of practical skills. The student's ability to perform well in either of those areas is weighted equally in the evaluation of student performance; this augments the probability that students who display any of the major learning styles will ultimately be successful in the course.
The course includes both a written and a practical final performance evaluation, weighted equally; again, this is intended to provide the most equitable probability for success to students who display differing abilities and talents.
Multiple attempts are allowed for the periodic quizzes given during the progress of the course; this is intended to optimize the possibility of success for the student who may come to us with inadequate reading skills or deficiencies in auditory learning skills, as well as to provide all of the students in the course with an alternative and additional learning experience.

The course content is presented in a number of different ways, including accessible PowerPoint and other forms of accessible presentations made available throughout the duration of the course on the CMS, along with physical demonstration and coaching on the part of the instructor.
Additionally, students will necessarily need to work together in teams of three or four; this will allow for a high degree of peer coaching under the supervision of the instructor.
Success in the course is weighted in favor of the ability to directly apply the scientific principles associated with the course to practical, physical activities, which functions as an advantage for students who possess any of the standard learning styles.
Finally, the coursework is focused on developing the student's ability to execute the final performance practicum, which is introduced at the beginning of the course and repeated at various times throughout; for example, the wheel alignment procedure is required after performing nearly every repair procedure necessary to restore the function of a steering or suspension system, so it will be repeated after those tasks are performed.

Interactions

Explain how the course will incorporate student-to-student interaction.

Because of the nature of the course and because the department's ability to provide lab space and necessary equipment is limited, students enrolled in the course will need to spend much of their time working in the lab as a part of a team of three or four students. For example, wheel alignment equipment is very expensive and occupies a lot of space, so access to it is limited; therefore, several students will need to share in its use. In the course of these activities, a great deal of peer coaching is both encouraged and takes place naturally; as a necessary product of this, a significant amount of student-to student interaction is infused into this course.

Explain how the course will incorporate instructor-to-student interaction.

Because this course involves the performance of a number of highly complex tasks, the instructor of the course will be required to demonstrate many of the procedures before the students can be reasonably expected to do the same. For example, the set-up and interpretation of wheel alignment data can be a challenge at first and the proper interpretation of the information that is obtained generally requires input from experienced personnel, which is, in this case, the instructor.
The instructor of this course will also be required to provide a significant amount of coaching about how best to perform certain procedures; again, to use the example of the alignment procedure, certain wheel alignment angles need to be checked and adjusted in a specific order and in particular ways in order to produce the optimal result. Therefore, a significant amount of instructor-to-student interaction is infused into this course as well.

Explain how the course will incorporate student-to-content interaction.

Automotive technology in general is an applied science. At the risk of belaboring the example, the principles of a wheel alignment and the interrelationship of that various alignment angles requires each student to directly apply the theory behind the task. In addition, the individual student needs to know why errors are encountered with the various angles, the cause of these errors, and how to repair them. This will necessitate that all students have repeated and direct interaction with the course's content.

Explain how the course will incorporate student-to-self interaction (metacognitive).

One aspect that is always emphasized in our industry is the necessity of verifying the effectiveness of a repair or procedure; did the job actually turn out as expected, and address the customer's original complaint or issue?
The content that the student encounters in this course is no different; the end result of the student's activities revolve around the results obtained. Does the vehicle track in a straight line? Do the tires show normal wear patterns and a normal lifespan? The answer to these questions will indicate to the student the amount of proficiency that the student has achieved; it will answer the question of how much, and how well, the student learned and whether the student has become proficient in applying that learning.

Key: 393