



Course Syllabus 2021 – 2022

Program

Automotive Technology I
Brakes , Steering & Suspension (NATEF – MLR)

Instructor

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Course Description

A specific technical course designed to teach the principles of automotive suspension/steering systems and 4-wheel suspension alignment. This course builds on the essential concepts of geometry, hydraulics laws, and characteristics of liquids and how they apply to the operation and diagnosis of power steering and suspension systems. Steering column operation and diagnosis including supplemental restraint system service will be included. The course will cover the fundamentals of short/long-arm, and strut suspensions, including: caster, camber, toe and thrust angle, and how they apply to steering, suspension, and 4-wheel alignment. The following wheel balance terms will be specifically explained: static balance, dynamic balance, tramp, and radial force variation. The brakes portion builds on the essential laws of physics, motion, forces, hydraulics, thermodynamics, and chemical reactions and how these principles apply to the operation and diagnosis of automotive brake systems. This will cover the energy conversion of motion changed to heat energy (when you apply brakes), the effects of weight and speed on braking and stopping distance, friction, force, and coefficient of friction as they apply to braking systems. Courseware covers the fundamentals and service of disc/drum brakes including how they operate, brake-fluid properties, diagnosis, component replacement/repair/adjustment, disc/drum machining, and power-assist units; and the fabrication (ISO and double flaring) of brake lines. Students will learn strategy-based diagnostic routines, in order to interpret and verify customer concerns and proper operation, and to perform tests and inspection to determine the causes and make corrections related to brakes, suspension/steering/wheel systems and alignment. Through the inspection, testing, or measurement of component processes, students will learn to apply this knowledge to determine needed repairs and correctly repair a vehicle.

Textbook

Van Gelder & Andrew. *Fundamentals of Automotive Maintenance and Light Repair*. Burlington, MA: Jones & Bartlett Learning – CDX Automotive. (2015)

Course Goals

Suspension & Steering Systems

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
2. Disable and enable supplemental restraint system (SRS).
3. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
4. Determine proper power steering fluid type; inspect fluid level and condition.
5. Inspect pitman arm, relay (center-link/intermediate) rod, idler arm and mountings, and steering linkage damper.
6. Inspect tie rod ends (sockets), tie rod sleeves, and clamps.
7. Inspect upper and lower control arms, bushings, and shafts.
8. Inspect and replace rebound and jounce bumpers.
9. Inspect track bar, strut rods/radius arms, and related mounts and bushings.
10. Inspect upper and lower ball joints (with or without wear indicators).
11. Inspect suspension system coil springs and spring insulators (silencers).
12. Inspect suspension system torsion bars and mounts.
13. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.
14. Inspect strut cartridge or assembly.
15. Inspect front strut bearing and mount.
16. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.
17. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
18. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
19. Describe the function of the power steering pressure switch.
20. Perform pre-alignment inspection and measure vehicle ride height; determine necessary action.
21. Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action.
22. Rotate tires according to manufacturer's recommendations.
23. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
24. Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
25. Inspect tire and wheel assembly for air loss; perform necessary action.
26. Repair tire using internal patch.

Brakes

27. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
28. Install wheel and torque lug nuts.
29. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.
30. Check the master cylinder for external leaks and proper operation.
31. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action.
32. Select, handle, store, and fill brake fluids to proper level.
33. Identify components of brake warning light system.
34. Bleed and/or flush brake system.
35. Test brake fluid for contamination.
36. Remove, clean, inspect, and measure brake drum diameter; determine necessary action.
37. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
38. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.
39. Remove, inspect, and replace pads and retaining hardware; determine necessary action.
40. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.

Course Goals - Continued

41. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action.
42. Remove and reinstall the rotor.
43. Check brake pad wear indicator; determine necessary action.
44. Describe the importance of operating vehicles to burnish/break-in replacement brake pads according to manufacturer's recommendations.
45. Check brake pedal travel with, and without, engine running to verify proper power booster operation.
46. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
47. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.
48. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.
49. Check parking brake operation and parking brake indicator light system operation; determine necessary action.
50. Check operation of brake stop light system.
51. Replace wheel bearing and race.
52. Inspect and replace wheel studs.

Shop & Personal Safety Goals

1. Identify general shop safety rules and procedures.
2. Utilize safe procedures for handling of tools and equipment.
3. Identify and use proper placement of floor jacks and jack stands.
4. Identify and use proper procedures for safe lift operation.
5. Utilize proper ventilation procedures for working within the lab/shop area.
6. Identify marked safety areas.
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
8. Identify the location and use of eye wash stations.
9. Identify the location of the posted evacuation routes.
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
11. Identify and wear appropriate clothing for lab/shop activities.
12. Secure hair and jewelry for lab/shop activities.
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

Tools & Equipment

1. Identify tools and their usage in automotive applications.
2. Identify standard and metric designation.
3. Demonstrate safe handling and use of appropriate tools.
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

Preparing Vehicle for Service & Customer Goals

1. Identify information needed and the service requested on a repair order.
2. Identify purpose and demonstrate proper use of fender covers, mats.
3. Demonstrate use of the three C's (concern, cause, and correction).
4. Review vehicle service history.
5. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
6. Ensure vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.).

Professional Skills Assessments

Workplace Employability Skills

1. Reports to school daily on time; able to take directions and motivated to accomplish the task at hand.
2. Dresses appropriately and uses language and manners suitable for the workplace.
3. Maintains appropriate personal hygiene.
4. Meets and maintains employment eligibility criteria, such as drug/alcohol-free status, clean driving record, etc.
5. Demonstrates honesty, integrity and reliability.

Work Habits / Ethics

1. Complies with workplace policies/laws.
2. Contributes to the success of the team, assists others and requests help when needed.
3. Works well with all customers and coworkers.
4. Negotiates solutions to interpersonal and workplace conflicts.
5. Contributes ideas and initiative.
6. Follow directions.
7. Communicates (written and verbal) effectively with customers and coworkers.
8. Reads and interprets workplace documents; writes clearly and concisely.
9. Analyzes and resolves problems that arise in completing assigned tasks.
10. Organizes and implements a productive plan of work.
11. Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks.
12. Identifies and addresses the needs of all customers, providing helpful, courteous and knowledgeable service and advice as needed.

Evaluation of Learning

Student performance will be evaluated using multiple assessments involving assigned program activities. Student's course grades will be based on the following:

| Evaluation Criteria | Method of Evaluation | Percentage |
|------------------------------|---|-------------------|
| Tests | <ul style="list-style-type: none">● Quizzes and tests | 33.4% |
| Classroom and Lab Activities | <ul style="list-style-type: none">● Manipulative skills assessments● Lab assignments● Classroom assignments | 33.3% |
| Professional Skills | <ul style="list-style-type: none">● Workplace employability skills● Work habits/ethics | 33.3% |

Task Performance Rubric

| Level | Description |
|--------------|---|
| 5 | Mastered the competency (Exemplary) |
| 4 | Performs the competency satisfactorily (Proficient) |
| 3 | Capable of the competency but needs further practice |
| 2 | Applies the competency but only mastered a few essential attributes |
| 1 | Demonstrated exposure and has observed the competency |

Grading Scale

| Grade | Percentage |
|--------------|-------------------|
| A+ | 100% – 98% |
| A | 97% – 92% |
| A- | 91% – 90% |
| B+ | 89% – 88% |
| B | 87% – 82% |
| B- | 81% – 80% |

| Grade | Percentage |
|--------------|-------------------|
| C+ | 79% – 78% |
| C | 77% – 72% |
| C- | 71% – 70% |
| D+ | 69% – 68% |
| D | 67% - 62% |
| D- | 61% - 60% |
| F | 59% - Below |

Late Assignments

You may earn half credit for late assignments that have been turned in within a week of their due date. All assignments more than one week late will be zeros.

Student Organizations

Students in the Automotive Technology program will have the opportunity to participate in SkillsUSA. The goal of SkillsUSA is to build a student's technical and leadership skills in a career area. Students who wish to participate will be able to compete at local and state events. The students will also be involved in service learning projects to better one's community.

For more info please visit - www.skillsusa.org

Career Information

| MN Program of Study | |
|---|---|
| Career Field | Engineering, Manufacturing & Technology |
| Career Cluster | Transportation, Distribution & Logistics |
| Career Pathway | Facility and Mobile Equipment Maintenance |
| <i>Related occupations requiring additional education, training and/or certifications:</i> | |
| <ul style="list-style-type: none">● Aerospace Operations Technician● Aircraft Mechanic● Service Technician Automotive● Service Technician● Avionics Technician● Bus and Truck Mechanic● Collision Repair Technician | <ul style="list-style-type: none">● Off-Road Equipment Technician● Rail Locomotive Mechanic● Automobile Mechanic● Repairer Service Manager● Service Writer● Ship Mechanic and Repairer |
| Career Outlook | <i>information available @ www.iseek.org/careers</i> |

College Credit Opportunities & Professional Certifications

In the Automotive Technology course, you can earn ASE certifications and articulated college credits. Students will need to earn a “B” or better grade in their course work. College credits are available at the following schools:

- Anoka Technical College
- Dunwoody College of Technology
- Hennepin Technical College
- MN West Community & Technical College
- Ridgewater Community College
- Riverland Community College
- Rochester Community & Technical College
- St. Cloud Community & Technical College
- St. Cloud State University

Visit the following website for specific articulated college courses - www.ctecreditmn.com