



Course Syllabus 2021-2022

Program

Automotive Technology II
Engine Performance

Instructor

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Course Description

A specific technical course designed to teach the principles of automotive maintenance and light repair in the ASE task areas of Engine Repair, Engine Performance and HVAC (automotive heating and air conditioning systems).. This course builds on the essential laws of physics, thermodynamics, and chemical reactions and teaches how these principles apply to the operation and diagnosis of automotive systems. This course will cover distributorless (electronic ignition) and distributor ignition systems, fuel management, exhaust emission control, and computer input and output signals and will identify the diagnostic routines, to interpret and verify customer concerns, confirm proper operation, and perform tests and inspection using special tools and scan tools to determine the causes and make corrections related to emissions, driveability and HVAC concerns on systems with/without diagnostic trouble codes (DTC). Course work will also cover diagnostic trouble codes (DTC), interpretation of digital multimeter (DMM) readings and access and use of electronic service information (ESI). The student will learn to locate and interpret vehicle component identification numbers (VIN, vehicle certification labels, and calibration decals), check and adjust (where applicable) ignition system timing, emission component service, and computerized engine control system data and service. HVAC training will include the inspection and service of heating and air conditioning systems as outlined in the course outcomes. Through the process of inspection, testing, or measurement of components, the student will learn to apply this knowledge to determine actions needed and accomplish the tasks as listed under NATEF Maintenance and Light Repair for: Engine Repair, Engine Performance, and HVAC.

Textbook & Classroom Resources

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

Course Goals

Engine Repair

1. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
2. Install engine covers using gaskets, seals, and sealers as required.
3. Remove and replace timing belt; verify correct camshaft timing.
4. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
5. Identify hybrid vehicle internal combustion engine service precautions.
6. Adjust valves (mechanical or hydraulic lifters).
7. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core and galley plugs; determine necessary action.
8. Remove, inspect, and replace thermostat and gasket/seal.
9. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.
10. Perform engine oil and filter change.

Electrical / Electronic Systems

11. Identify high-voltage circuits of electric or hybrid electric vehicles and related safety precautions.
12. Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery.
13. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.
14. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
15. Aim headlights.
16. Identify system voltage and safety precautions associated with high-intensity discharge headlights.

Heating & Air Conditioning

17. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
18. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
19. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.
20. Inspect A/C condenser for airflow restrictions; determine necessary action.
21. Inspect engine cooling and heater systems hoses; perform necessary action.
22. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.
23. Identify the source of A/C system odors.

Engine Performance

24. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
25. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
26. Perform cylinder power balance test; determine necessary action.
27. Perform cylinder cranking and running compression tests; determine necessary action.
28. Perform cylinder leakage test; determine necessary action.
29. Verify engine operating temperature.
30. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.
31. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
32. Describe the importance of operating all OBDII monitors for repair verification.
33. Replace fuel filter(s).
34. Inspect, service, or replace air filters, filter housings, and intake duct work.
35. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.
36. Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed.
37. Check and refill diesel exhaust fluid (DEF).

38. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.

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 the 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.

Skills Needed for Success

- Must be able to work independently
- Mechanical aptitude
- Good problem solving skills
- Detail oriented
- Manual dexterity
- Strong technical reading, writing, math and computer skills
- Team player, responsible, and good communicator

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.

TSA Assessment

Automotive Service Excellence (ASE) – Student Certification Tests:

- Maintenance & Light Repair
- Engine Performance
- Electrical/Electronic Systems

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