



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

Course Number
AUT111

Course Title
Automotive Service Fundamentals

Credits
5

Hours:
Lecture/Lab/Other
2/ 6

Co- or Pre-requisite
Co: AUT 110 AND MAT 037 or MAT 042

Implementation
Spring 2022

Catalog description:

Introduction to the automobile and its operating systems. Emphasizes theories of operation, service facility practices and current servicing procedures, with detailed attention to each individual system including diagnosis and repair. Personal safety policies in the work environment are emphasized in detail.

General Education Category:
Not GenEd

Course coordinator:
Jason Evans, Ext. 3776, evansj@mccc.edu

Required texts & Other materials: Halderman, James D. and Deeter, Darrell, Introduction to Automotive Service, Pearson Education, 2013 ISBN: 9780132540087

Access to a personal laptop computer, tablet, or Chromebook is strongly recommended during class and lab.

Students must purchase safety glasses, work boots, and appropriate clothing to work in the automotive lab. This requirement is reviewed with the students on the first day of class. These items are not needed for the first class meeting of the term.

The following is provided at no charge to the students: Vehicle service information provided through Stellantis, Subaru of America, Audi of America, or ALLDATA.

Accreditation Statement:

The Automotive Technology, Mopar CAP, Program is Master Automotive Service Technology (MAST) accredited by Automotive Service Excellence Education Foundation.

<https://www.aseeducationfoundation.org/>

Course Student Learning Outcomes (SLO):

Upon successful completion of this course, the student will be able to:

1. Demonstrate the proper procedure to perform automotive service and repair following protocol that adheres to personal safety and the safety of others working in the repair facility or auto shop. [Supports ILG # 1, 9, 10, 11; PLO # 1, 2, 3, 4]
2. Demonstrate the use of basic hand tools and be able to use basic hand tools to perform service and repair of automotive systems. This includes fastener thread repair. [Supports ILG # 1, 9, 10, 11; PLO # 1, 2, 3, 4]
3. Explain the fundamental theories of operation of automobile lubrication systems, liquid cooling systems, fuel delivery systems, and electronic ignition systems. [Supports ILG # 1, 3, 4, 11; PLO # 1, 2, 3, 4]
4. Analyze engine cooling system, fuel system, ignition system, and lubrication system malfunctions and follow diagnostic procedures that result in the resolution of the malfunction. [Supports ILG # 3, 4, 10, 11; PLO # 1, 2, 3, 4]
5. Demonstrate his or her ability to perform service work to the engine cooling system, ignition system, and lubrication system. [Supports ILG # 2, 4, 10, 11; PLO # 1, 2, 3, 4]
6. Apply his or her knowledge to verify proper operation of system components and identify components that are not operating within normal parameters with the use of a diagnostic scan tool. [Supports ILG # 1, 2, 4, 10, 11; PLO # 1, 2, 3, 4]
7. Use electronic service information to obtain guidance before beginning the diagnosis and/or repair of automobile systems. [Supports ILG # 1, 10, 11; PLO # 1, 2, 3, 4]
8. Demonstrate his or her ability to communicate with automotive repair professionals in a manner that follows standards of the automotive repair industry. [Supports ILG # 1, 10, 11; PLO # 1, 2, 3, 4]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.

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

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

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

Institutional Learning Goal 9. Ethical Reasoning and Action. Students will understand ethical frameworks, issues, and situations.

Institutional Learning Goal 10. 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.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for

1. Diagnose, service, and repair current automotive technologies.
2. Demonstrate desirable attitudes and work habits while working individually or with others.
3. Obtain service repair information and procedures from online websites and electronic databases.
4. Communicate effectively and professionally with customers and fellow technicians.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **Shop Safety and Hazardous Materials [Supports Course SLO # 1, 9, 10, 11]**

Learning Objectives

The student will be able to:

- Explain proper shop safety procedures when using shop equipment such as hydraulic equipment, power tools, and hand tools.
- Demonstrate the proper way to safely hoist a vehicle on a twin-post vehicle lift and drive-on vehicle lift.
- Locate, identify, and operate common auto shop safety devices such as fire extinguishers, fire blankets, first aid kits, electrical power safety interrupt switches, fire alarms, emergency exits, and automotive exhaust ventilation systems.
- Indicate hazardous material handling and removal procedures provided by the Material Safety Data Sheets (MSDA).
- Demonstrate compressed air regulation when using the airline.

Unit II **Basic Hand Tools and Usage [Supports Course SLO # 1, 2, 5]**

Learning Objectives

The student will be able to:

- Recognize safety procedures while using or working around hand tools.
- Explain proper tool usage for a specific service or repair processes and describe the uses of basic hand tools.
- Evaluate basic hand tools to determine if they are damaged, worn, and must be removed from service to prevent personal injury and damage to automotive components.
- Determine measurements using a metric and standard micrometer.

Unit III **Fasteners and Thread Repair [Supports Course SLO # 1, 2, 8]**

Learning Objectives

The student will be able to...

- Determine fastener thread sizes and designations including standard and metric, National Course (NC) or National Fine (NF), fastener diameter, fastener length, and pitch.
- Describe which fasteners should be used for various applications and determine proper fastener grade.
- Demonstrate his or her ability to perform threaded fastener repair and install a Heli-Coli into a casting.
- Select the most efficient way to extract a broken or seized fastener using the proper tools for the application.
- Give examples of non-threaded fasteners and their use.

Unit IV **Under Hood/Under Car Inspection [Supports Course SLO # 1, 2, 3, 4, 5, 7, 8]**

Learning Objectives

The student will be able to...

- Use electronic vehicle service information provided through Stellantis, Subaru of America, Audi of America, or ALLDATA.
- Demonstrate his or her ability to access online data related to specifications and service procedures.
- Identify fluid types, inspect fluid levels and condition, inspect for component wear and leaks, inspect tires and under vehicle components for damage and wear while performing an under hood multi-point inspection.
- Locate and analyze safety and functionality concerns found during routine vehicle maintenance for gasoline and diesel engines.
- Point out recommendations to customers regarding needed vehicle repairs and service during a multi-point inspection.

Unit V Introduction to Automotive Repair Facilities [Supports Course SLO # 1, 2, 8]

Learning Objectives

The student will be able to...

- Show how to document diagnostic and service routines on repair orders, using the “3 C’s” (concern/cause/correction), labor operations, flagged repair time, and warranties policies.
- Locate appropriate diagnostic and repair procedures using electronic vehicle service information.
- Understand the purpose and function of the Six-Step Diagnostic Procedure.
- Prepare for student internship at a vehicle manufacture dealership. This includes writing a resume, preparing for the interview, follow-up after the interview, and expectations on the first day of work.
- Clarify the purpose and general operation of most for-profit (commercial) automotive repair businesses.
- Describe technical training opportunities.

Unit VI New and Used Vehicle Preparation Procedures [Supports Course SLO # 1, 3, 4, 6, 7, 8]

Learning Objectives

The student will be able to...

- Demonstrate the procedure to perform safety and functionality inspections of new and used automotive systems and components prior to delivery of the vehicle to a customer.
- Show how to follow warranty procedures to resolve issues found during new vehicle preparation.
- Demonstrate the process to perform a new vehicle inspection to evaluate repairs and/or services needed before the vehicle is sold to a customer.

Unit VII Fundamentals of The Internal Combustion Engine [Supports Course SLO # 1, 2, 3, 4, 5, 8]

Learning Objectives

The student will be able to...

- Explain the 4-stroke cycle theory: Intake, Compression, Power, and Exhaust.
- Recognize the purpose and operation of internal and external engine components.
- Compare the similarities and differences between the combustion process that takes place in gasoline and diesel engines.
- Describe engine displacement and engine performance measurements.
- Show proficiency in completing engine condition diagnosis testing, including compression tests, cylinder leakage tests, vacuum tests and power balance tests.

Unit VIII Vehicle Systems Fundamentals [Supports Course SLO # 1, 2, 3, 4, 5, 7, 8]

Learning Objectives

The student will be able to...

- Indicate the function and operation of liquid cooling systems.
- Indicate the function and operation of engine lubrication systems.
- Analyze the operation of liquid cooling systems and lubrication systems and determine the root cause of system malfunctions by following diagnostic procedures
- Clarify the importance of proper maintenance for engine cooling and lubrication systems.
- Demonstrate his or her knowledge of automotive engine lubrication system by explaining how oil pressure is created and explain common failures that result in low engine oil pressure.
- Show proficiency in performing an engine cooling system flush and oil change.

Unit IX Electronic Ignition Systems [Supports Course SLO # 1, 2, 3, 4, 5, 7, 8]

Learning Objectives

The student will be able to...

- Explain electronic ignition system design and operation.
- Analyze an electronic ignition system and determine the type of electronic ignition system installed on a vehicle.
- Use an ohmmeter to measure resistance of the ignition coils on the primary and secondary coil windings.
- Use the appropriate measuring tools to take spark plug gap measurements.
- Evaluate internal engine failures based on condition of spark plugs.
- Demonstrate the procedure to diagnose and repair malfunctions in an electronic ignition system.

Unit X Introduction to Diagnostic Scan Tools [Supports Course SLO # 1, 6, 7, 8]

Learning Objectives

The student will be able to...

- Show how to connect the scan tool to the vehicle and communicate with the control modules that operate vehicle systems.
- Identify control modules and their function.
- Analyze system data readings and determine possible sources of system malfunctions.
- Demonstrate how to read and erase diagnostic trouble codes (DTC's) stored in vehicle control modules.
- Understand the diagnostic procedure available in service information and the scan tool.

Evaluation of student learning:

Students are evaluated using weekly quizzes, a mid-term exam, a final exam, graded homework assignments, and hands-on work assignments in the automotive laboratory. Students are expected to read the assigned textbook chapters, handouts, and complete vehicle manufacturers' training material (if applicable) outside of class and at appropriate times throughout the course.

Please note that:

- Any student who scores below a 60% (D) on the final exam must repeat the course
- AUT 111 is a prerequisite course to all other automotive courses in the curriculum. Therefore, a minimum course grade of 70% (C) is needed to pass AUT 111.
- Students enrolled in the any automotive program option sponsored by a vehicle manufacturer (Mopar CAP, Subaru University, or Audi AEP) must complete all vehicle manufacturer web courses, post-tests, and proctored assessments assigned at the start of the semester. The assigned web courses, post-test, and proctored assessments are in addition to the standard course assignments shown below. Due dates for each assigned web course, post-test, and proctored assessment is discussed in class, but all of them must be finished and passed before the beginning of the last week of the term.

Below is a list of the tools used for assessing student learning outcomes in this course. The percentages shown after each assessment tool refers to the weight each assessment has on a student's final course grade. Percentages are approximate.

Exams 25%

Quizzes 15%

Hands-On Lab Assignments 35%

Homework 10%

Manufacture Training 15%

Policy Statement for Missed Lab Demonstrations:

Due to the concerns for student and staff safety, a student who does not attend tool, equipment, and procedure demonstrations performed by the course instructor, prior to a hands-on learning activity, may be excluded from participating in the hands-on activity. This occurs because the tools, equipment, and chemicals necessary to complete automotive diagnosis and service often present safety hazards for users and observers if the correct handling procedures are not followed.

Reasons for not attending demonstrations may include full or partial absence during the demonstration, or if a student does not give his or her full attention during the demonstration. Enforcement of this classroom policy is at the discretion of the course instructor, and is based largely on the dangers involved with the use of the necessary tools, equipment, and chemicals required to complete the hands-on activity, and the time necessary to complete a make-up demonstration.