Course Number: AUT 213  
Course Title: Engine Service  
Credits: 4  

Hours: lecture/Lab/Other  
2/5  

Co- or Pre-requisite: AUT 110 and AUT 111  

Implementation: sem/year  
Fall 2020  

Catalog description (as it appears in 2020-2021 edition):  
Diagnosis, failure analysis, and rebuilding procedures for automobile engines. Topics include engine operating principles, component measurement techniques, engine removal and installation, and service information usage for diagnosis. Each student is required to completely disassemble, diagnose, and assemble several gasoline and diesel engines. Involves extensive use of special tools and equipment.

Is course New, Revised, or Modified? Revised

Required texts/other materials: Halderman, James D., Automotive Engines: Theory and Servicing, (current edition), Pearson Education

Revision date: Spring 2020  
Course coordinator: Jason Evans evansj@mccc.edu, ext. 3776

Information resources: DealerConnect web-site, service manuals, Subaru of America resources, online and self-study courses and the AllData online service information database

Other learning resources: (Describe any other student learning resources that are specific to this course, including any special tutoring or study group support, learning system software, etc.)

Course Competencies/Goals:  
The student will be able to:  
1. Explain the function and operation of a four-cycle engine  
2. Evaluate the internal and external condition of an engine assembly through visual inspection and by using specialized tools and shop equipment  
3. Analyze engine component wear patterns to identify abnormalities that can effect fit, final engine assembly, and engine performance  
4. Obtain service repair information and procedures from the appropriate online service information database using the computers found in the automotive facility  
5. Demonstrate his/her ability to fully disassemble and reassemble a complete engine by following published service procedures  
6. Demonstrate safety practices when working with running engines and heavy components
7. Identify the proper tools and equipment necessary for service and repair of internal and external engine mechanical systems
8. Explain the differences in the construction and operation of gasoline and diesel engines

**Course-specific Institutional Learning Goals (ILGs)/General Education Goals.**

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

**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 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.

**Units of study in detail.**

**Unit I: Review of Basic Engine Theory of Operation and Basic Engine Construction**

_The student will be able to:_

- Explain the operation of gasoline and diesel four cycle operation (**Course Competency 1**; ILG 1)
- Identify possible internal failures that can cause a poor running engine (**Course Competency 1 & 2**)
- Describe the function of the basic parts of a gasoline and diesel engine (**Course Competency 8**; ILG 4)
- Exercise safety practices while working on or near a running engine (**Course Competency 6**; ILG 10)

**Unit II: Engine Condition Diagnosis**

_The student will be able to:_

- Perform a comprehensive engine condition analysis using electronic and mechanical instruments (**Course Competency 2, 6, & 7**)
- Evaluate test data to determine potential internal and external engine mechanical faults prior to engine disassembly (**Course Competencies 2 & 4; ILGs 4 & 10**)
- Demonstrate how to locate the cause of abnormal engine noises prior to engine disassembly (**Course Competencies 2, 4, 6, & 7; ILG 10**)
- Describe the proper procedure for locating the source of excessive engine oil consumption (**Course Competencies 2, 4, 6, & 7; ILG 10**)

**Unit III: Engine Component Inspection and Measurement Tools and Techniques**

_The student will be able to:_

- Perform measurement checks on new and worn engine components to evaluate fit and condition (**Course Competencies 2, 3, & 4; ILG 4**)
- Determine the steps necessary to correct problems detected during condition checks of engine components (**Course Competency 4; ILG 4**)
- Identify possible causes of damaged or excessively worn components found during component condition checks and recommend corrective actions (**Course Competency 4; ILG 4**)
- Demonstrate his/her ability to use measurement tools properly (**Course Competency 7**)
• Explain industry acceptable methods for detecting cracks in iron and aluminum assemblies (Course Competency 2; ILG 1)
• Explain industry acceptable methods for cleaning internal and external engine components (Course Competency 2; ILG 1)

Unit IV: In-Vehicle Engine Service and Repair
The student will be able to:
• Determine which engine services and repairs procedures can be performed without removing the engine from the vehicle (Course Competency 4; ILG 10)
• Describe the general procedures for in-vehicle replacement of cylinder head gaskets on overhead cam and overhead valve engines (Course Competency 4 & 7; ILGs 4 & 10)
• Explain the limitations of in-vehicle engine repairs (Course Competency 7; ILG 11)
• Explain typical vehicle systems and components that must be removed, drained, or repositioned to allow in-vehicle engine repair (Course Competency 4; ILGs 4 & 11)

Unit V: Overview of Engine Removal and Installation Procedures
The student will be able to:
• Locate manufacturer-published engine removal procedures from appropriate service information databases (Course Competency 4; ILGs 1 & 4)
• Identify potential dangers to humans, the environment, and the vehicle present during engine removal and installation (Course Competencies 6 & 7; ILGs 4 & 10)
• Identify the proper tools needed to hoist an engine during removal and installation (Course Competencies 4 & 7; ILGs 4 & 10)
• Locate an engine’s proper lifting points prior to connecting a hoist (Course Competency 4; ILG 4)
• Explain typical vehicle systems and components that must be removed, drained, or repositioned to allow engine removal or installation (Course Competency 4; ILG 4)

Unit VI: Bottom End (Short-Block) Construction, Design, Service, and Repair Procedures
The student will be able to:
• Demonstrate piston removal and installation procedures accepted by following industry-defined methods and as outlined in published service procedures (Course Competencies 4 & 7; ILG 10)
• Describe the procedures needed to remove different types of piston pins (Course Competencies 4 & 7; ILGs 1 & 10)
• Explain how a piston’s reciprocal motion is converted into rotational motion to propel the vehicle (Course Competency 1; ILG 1)
• Identify components found in a short-block and analyze their condition (Course Competencies 1 & 2; ILG 10)
• Describe why a component is reusable or if there is a need for service or replacement, following inspection and measurement checks of critical areas (Course Competencies 2, 3, & 4; ILGs 1 & 10)
• Remove and install crankshaft main bearings, camshaft (in-block) bearings, and connecting rod bearings by following published service procedures (Course Competencies 4, 5, & 7; ILG 10)
Unit VII: Upper Engine Construction, Design, Service, and Repair Procedures

The student will be able to:

- Demonstrate the proper techniques to recondition a cylinder head by following industry standards and published service procedures (Course Competencies 3, 4, & 7; ILG 10)
- Explain the procedures available for cylinder head crack detection and the recommended repairs for cast iron and aluminum construction (Course Competency 7; ILG 1)
- Operate a valve grinding and valve seat cutting machine by following the manufacturers recommended safety and operating procedures (Course Competencies 4 & 7)
- Explains the function and operation of different cylinder head designs and applications (Course Competency 8; ILG 1)
- Analyze a cylinder head to determine the need for reconditioning or replacement (Course Competencies 3, 4, & 7; ILGs 10 & 11)
- Analyze cylinder head damage and determine potential causes of the damage (Course Competencies 3 & 4; ILGs 10 & 11)
- Disassemble and assemble an overhead valve and overhead camshaft cylinder head using the appropriate tools and techniques, and following published service procedures (Course Competencies 4, 5, & 7; ILG 1)

Unit VIII: Valvetrain and Valve Timing Systems

The student will be able to:

- Explain the advantages and disadvantages of the cutting different valve and seat angles (Course Competencies 8)
- Describe the operation of valve timing system components (Course Competency 1; ILGs 10)
- Visually inspect a valve timing systems to identify system type and operation (Course Competencies 1, 4, & 8)
- Set valve timing on a real engine by following published service procedures and using proper tools and techniques (Course Competencies 4 & 7; ILG 10)
- Explain the fundamental design differences between overhead cam and overhead valve engine timing systems (Course Competencies 1 & 4; ILG 10)
- Identify potential symptoms associated with incorrect valve timing (Course Competencies 1, 2, & 4; ILG 10)
- Explain mechanical damage associated with timing systems failure of an overhead cam and overhead valve engine (Course Competencies 3 & 5; ILGs 4 & 10)
- Before engine disassembly, identify if an engine’s timing system is belt, chain, or gear driven (Course Competencies 4; ILG 10)

Unit IX: Gasoline Engine Assembly and Start-Up Procedures

The student will be able to:

- Demonstrate the proper techniques for assembling an engine using published service procedures (Course Competencies 4, 5, & 7; ILG 10)
- Explain the importance of proper fastener torque (Course Competencies 3, 4, 5, & 8; ILG 10)
- Identify one-time-use fasteners, such as torque-to-yield bolts, by following published service procedures (Course Competency 4; ILG 10)
- Explain the importance of engine priming procedures prior to starting a new or newly rebuild engine for the first time (Course Competency 3 & 4)
- Explain commonly overlooked steps during an engine assembly procedure (Course Competencies 3, 4, & 7; ILG 10)
• Identify engine seals and gaskets as either reusable or one-time-use (Course Competency 4; ILG 10)
• Identify proper sealants needed to assemble a gasoline (Course Competency 4; ILG 10)

Unit X: Diesel Engine Disassembly, Assembly, and Start-Up Procedures
The student will be able to:
• Demonstrate the proper techniques for assembling an engine using published service procedures (Course Competencies 4, 5, & 7; ILG 10)
• Identify special tools and/or equipment needed to disassemble/assemble a diesel engine (Course Competencies 4 & 7; ILG 10)
• Explain the importance of proper fastener torque (Course Competencies 3, 4, 5, & 8; ILG 10)
• Identify one-time-use fasteners, such as torque-to-yield bolts, by following published service procedures (Course Competency 4; ILG 10)
• Explain the importance of engine priming procedures prior to starting a new or newly rebuild engine for the first time (Course Competency 3 & 4; ILG 10)
• Explain commonly overlooked steps during an engine assembly procedure (Course Competencies 3, 4, & 7; ILG 10)
• Identify engine seals and gaskets as either reusable or one-time-use (Course Competency 4; ILG 10)
• Identify proper sealants needed to assemble a diesel engine (Course Competency 4; ILG 10)

Policy Statement for Missed Lab and Equipment Demonstrations:
Due to the technical nature of the Automotive Program and hazards involved with the use of specialty tools and equipment, a student that is absent from lab instruction, where demonstrations are performed by the course instructor, will not be permitted to complete the related lab work upon their return. This includes full-day absences and partial-day absences that result in missing the lab demonstration(s). Enforcement of these policies will be at the discretion of the course instructor.

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 manufacturers’ training material (if applicable) 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
• Students enrolled in the Mopar Career Automotive Program (Mopar CAP) must complete all course-related Fiat Chrysler Automobiles (FCA) web courses and post-tests assigned at the start of the semester. The Mopar CAP requirements are in addition to the requirements stated above.
**Academic Integrity Statement:**

A student who knowingly represents the work of others as his/her own, uses or obtains unauthorized assistance in the execution of any academic work, gives fraudulent assistance to another student, or inappropriately or unethically uses technological means for academic gain is guilty of cheating. Submitting your own work from a previous course without the permission of your current course instructor is also deemed an academic integrity violation (See Student Handbook). Any student who violates this policy is subject to receive a failing grade for the assignment and will be reported to the Office of Student Affairs for further disciplinary action. Possible dismissal from the course could result.

**Reasonable Accommodations for Students with Documented Disabilities**

Mercer County Community College is committed to supporting all students in their academic and co-curricular endeavors. Each semester, a significant number of students document disabilities, which may require learning, sight, hearing, manual, speech, or mobility accommodations to ensure access to academic and co-curricular activities. The college provides services and reasonable accommodations to all students who need and have a legal entitlement to such accommodations.

For more information regarding accommodations, you may visit the Office of Academic Support Services in FA129 or contact them at 609.570.3422

Mercer County Community College is in compliance with both the ADA and section 504 of the Rehabilitation Act. If you have, or believe you have, a differing ability that is protected under the law, please see Arlene Stinson in LB216, at 609-570-3525 or at stinsona@mccc.edu for information regarding support services.