

**COURSE PREFIX / NO: AUT 107**

**COURSE TITLE: ADVANCED ENGINE REPAIR**

**LEC HRS / WEEK: 2.0**

**LAB HRS / WEEK: 6.0**

**CREDIT HRS / SEMESTER: 4.0**

**DL ATTENDANCE/VA STATEMENT  
TEXTBOOK INFORMATION**

## **COURSE DESCRIPTION**

This course includes an advanced application of engine fundamentals, including engine removal, internal diagnosis and repair procedures, engine assembly and installation procedures.

## **COURSE COMPETENCIES**

Upon successful completion of this course, the student should be competent to perform the following tasks:

### **Module 1. General Engine Diagnosis; Removal and Installation**

1. Verify and interpret engine concern; determine necessary action.
2. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
3. Diagnose engine noises and vibrations; determine necessary action.
4. Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound; determine necessary action.
5. Perform engine vacuum test; determine necessary action.
6. Perform cylinder balance test; determine necessary action.
7. Perform cylinder compression test; determine necessary action.
8. Perform cylinder leakage test; determine necessary action.
9. Remove engine (front-wheel drive); prepare for disassembly.
10. Reinstall engine (front-wheel drive).
11. Remove engine (rear-wheel drive); prepare for disassembly.

12. Reinstall engine (rear-wheel drive).
13. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and engine diagnostic equipment; determine necessary action.

## **Module 2. Cylinder Head and Valve Train Diagnosis and Repair**

1. Inspect pushrods, rocker arms, rocker arm pivots, and shaft for wear, bending, cracks, looseness, and blocked oil passages; perform necessary action.
2. Inspect hydraulic or mechanical lifters; replace as needed.
3. Inspect camshaft drives (including gear wear and backlash, sprocket and chain wear); replace as needed.
4. Inspect and replace timing belts, overhead camdrive sprockets, and tensioners; check belt tension; adjust as necessary.
5. Inspect camshaft for runout, journal wear, and lobe wear.
6. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.
7. Verify camshaft(s) timing according to manufacture's specifications and procedure.

### **Module 3. Engine Block Assembly Diagnosis and Repair**

1. Remove cylinder wall ridges.
2. Deglaze and clean cylinder walls.
3. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.
4. Inspect and measure main and connecting rod bearings for damage, clearance, and end play; determine necessary action (includes the proper selection of bearings).
5. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore condition.
6. Inspect, service, and measure pistons and pins; determine necessary action.
7. Reassemble engine components using correct gaskets and sealants.
8. Inspect auxiliary (balance, intermediate, idler, counter balance or silencer) shaft(s); inspect shaft(s) and support bearings for damage and wear; determine necessary action; reinstall and time.
9. Prime engine lubrication system.

## **Module 4. Lubrication and Cooling Systems Diagnosis and Repair**

1. Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action.
2. Test coolant; drain and recover coolant; flush and recover cooling system with recommended coolant; bleed air as required.
3. Inspect, and test fan(s) (electrical and mechanical), fan clutch, fan shroud, and air dams.
4. Inspect auxiliary oil coolers; replace as needed.
5. Inspect, test, and replace oil temperature and pressure switches and sensors.

## **PERFORMANCE OBJECTIVES**

### **Module 1.General Engine Diagnosis; Removal and Installation**

1. Given an engine, the student will verify and interpret engine concerns and determine necessary action according to NATEF standards.
2. Given an engine, the student will inspect an engine assembly for fuel, oil, coolant, and other leaks. The student will then determine the necessary action according to NATEF standards.
3. Given an engine, the student will diagnose engine noises and vibrations and determine the necessary action according to NATEF standards.
4. Given an engine, the student will diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound and determine the necessary action according to NATEF standards.
5. Given an engine, the student will perform a vacuum test and determine the necessary action according to NATEF standards.
6. Given an engine, the student will perform a cylinder balance test and determine the necessary action according to NATEF standards.
7. Given an engine, the student will perform a cylinder compression test and determine the necessary action according to NATEF standards.

8. Given an engine, the student will perform a cylinder leakage test and determine the necessary action according to NATEF standards.
9. Given a vehicle, the student will remove an engine (front-wheel drive) and prepare it for disassembly according to NATEF standards.
10. Given a vehicle, the student will reinstall an engine (front-wheel drive) according to NATEF standards.
11. Given a vehicle, the student will remove an engine (rear-wheel drive) and prepare it for disassembly according to NATEF standards.
12. Given a vehicle, the student will reinstall an engine (rear-wheel drive) according to NATEF standards.
13. Given an engine, the student will diagnose engine mechanical, electronic, fuel, and ignition concerns with an oscilloscope and engine diagnostic equipment and determine the necessary action according to NATEF standards.

## **Module 2. Cylinder Head and Valve Train Diagnosis and Repair**

1. Given an engine, the student will inspect pushrods, rocker arms, rocker arm pivots, and shafts for wear, bending, cracks, looseness, and blocked oil passages and perform the necessary actions according to NATEF standards.
2. Given an engine, the student will inspect hydraulic and mechanical lifters and replace as needed according to NATEF standards.
3. Given an engine, the student will inspect camshaft drives (including gear wear and backlash, sprocket and chain wear) and replace as needed according to NATEF standards.
4. Given an engine, the student will inspect and replace timing belts, overhead camdrive sprockets, tensioners, and check belt tension and adjust as necessary according to NATEF standards.
5. Given an engine, the student will inspect camshaft for run-out, journal wear, and lobe wear according to NATEF standards.
6. Given an engine, the student will verify camshaft(s) timing according to manufactures specifications and procedures according to NATEF standards.

### **Module 3. Engine Block Assembly Diagnosis and Repair**

1. Given an engine block, the student will remove cylinder wall ridges according to NATEF standards.
2. Given an engine block, the student will deglaze and clean cylinder walls according to NATEF standards.
3. Given an engine block, the student will inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment, and determine the necessary action according to NATEF standards.
4. Given an engine block assembly, the student will inspect and measure connecting rod bearings for damage, clearance, and end play, and determine the necessary action according to NATEF standards (this includes the proper selection of bearings).
5. Given an engine block assembly, the student will identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; inspect rod alignment and bearing bore conditions according to NATEF standards.
6. Given an engine block assembly, the student will inspect, service, and measure piston pins, and determine the necessary action according to NATEF standards.
7. Given an engine block assembly, the student will assemble the engine components using correct gaskets and sealants according to NATEF standards.
8. Given an engine block assembly, the student will inspect auxiliary (balance, intermediate, idler, counter balance or silencer) shaft(s); inspect shaft(s) and support bearings for damage and wear; determine the necessary actions; reinstall and time according to NATEF standards.
9. Given an engine block assembly, the student will prime the engine lubrication system according to NATEF standards.

## **Module 4. Lubrication and Cooling Systems Diagnosis and Repair**

1. Given an engine, the student will perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature) and determine the necessary action according to NATEF standards.
2. Given an engine, the student will test coolant; drain and recover coolant; flush and recover coolant; flush and recover coolant with recommended coolant; bleed air as required according to NATEF standards.
3. Given an engine, the student will inspect and test fan(s) (electrical and mechanical), fan clutch, fan shroud, and air dams according to NATEF standards.
4. Given an engine, the student will inspect auxiliary oil coolers and replace as needed according to NATEF standards.
5. Given an engine, the student will inspect, test, and replace oil temperature and pressure switches and sensors according to NATEF standards.

## **COURSE REQUIREMENTS**

Students are responsible for attaining competencies through completion of the following course requirements:

### **ATTENDANCE:**

Students will be bound by the policies stated in the York Technical College Student Handbook. Students must attend 80% of the hours assigned the class for a semester to receive credit for the course. In case a student does miss a class, the student is responsible for obtaining the material that was covered during the absence. If a student is aware that a class will be missed, then the student should notify the instructor at the earliest possible date. Students with unexcused absences during tests will be allowed to make up tests at the discretion of the instructor. The student has the burden to be sure that some arrangement has been made with the instructor for taking a make-up test.

### **ACADEMIC HONESTY**

York Technical College adheres to the South Carolina Tech Student code, approved by the State Board for Technical and Comprehensive Education on March 13, 1974(revised last April, 25 1984). Copies of this code are available in

the Library and from Student Services. Any student involved in cheating or any other academic dishonesty will be given a grade of zero and will be subject to further disciplinary action. See the student handbook section “Student Life” subheading “Student Conduct” for further details.

### **PARTICIPATION IN CLASS**

Students will be expected to participate in class discussions, to demonstrate problem-solving techniques, to complete tests, homework, lab experiments, lab reports and other assigned work.

### **EVALUATION STRATEGIES / GRADING**

The grading scale will be as follows:

#### **Grade Points**

A	90-100
B	80-89
C	70-79
D	60-69
F	00-59

#### **Evaluation Method**

Tests may be written or oral and may contain questions that are true or false, short answer, multiple choice, fill in the blank and/or problems. Students should refer to the instructor for the number of tests to be given and the material to be covered on each test. Each test will be of equal weight unless otherwise indicated by the instructor. Lab grades will be based on the completion of the Course Competencies, teamwork, safety, class participation, and housekeeping.

Final grades will be determined as follows:

Module 1.	Test	8.25%
Module 1.	Lab	16.75%
Module 2.	Test	8.25%
Module 2.	Lab	16.75%
Module 3.	Test	8.25%
Module 3.	Lab	16.75%
Module 4.	Test	8.25%
Module 4.	Lab	<u>16.75%</u>
Total Grade		100%

### **ENTRY-LEVEL SKILLS**

Students should demonstrate hand eye coordination, manual dexterity, and be able to work in an industrial environment.

### **PREREQUISITES**

AUT-105

### **CO-REQUISITES**

None

### **TOPIC / CONTENT OUTLINE**

#### **Module 1. General Engine Diagnosis; Removal and Installation**

1. Engine rebuilding tools
2. Correct diagnosis of engine noises and vibrations
3. Correct diagnosis of engine leaks
4. Correct diagnosis of engine odors and smoke
5. Correct procedure for testing poor engine performance
6. Engine installation
7. Engine removal

## **Module 2. Cylinder Head and Valve Train Diagnosis and Repair**

1. Identify valve train components
2. Inspect valve train components for wear
3. Inspect cylinder heads for cracks and warpage
4. Valve train operation and adjustment
5. Camshaft timing

## **Module 3. Engine Block Assembly Diagnosis and Repair**

1. Using a ridge reamer
2. Using a cylinder hone
3. Measuring clearances
4. Inspecting engine parts for wear patterns
5. Using correct gaskets and sealers
6. Prime oiling system

## **Module 4. Lubrication and Cooling Systems Diagnosis and Repair**

1. Cooling system operation
2. Pressure testing system
3. Parts inspection
4. Testing coolant
5. Sending units and pressure switches

## **METHODS OF INSTRUCTION**

This course consists of two hours of classroom instruction and six hours of lab instruction. The classroom instruction includes lectures, discussions, problem solving sessions, and tests. The lectures are given while drawing on the blackboard, using overhead projections, videotapes, demonstrations, and other multimedia methods. The laboratory instruction includes proper safety procedures, instructions on the proper use of lab equipment, proper diagnosis of emission related problems, and hands on experience with live repair projects.

