

## **COURSE OUTLINE**

### Engine Performance III

#### **Course Description**

AT 201 Engine Performance III. 3 credit hours. Prerequisite: AT 104 with a C or better. This course will enable the student to diagnose and repair computerized engine control systems. The student will examine computer control functions, control circuits, and memory in relation to sensor and actuator circuitry. Sensor operating parameters and diagnosis are examined.

#### **Course Relevance**

The principles and techniques acquired in this course are common to the automotive industry and are the foundation for all computer control systems. Comprehension of these principles allows the student to effectively diagnose and repair common automotive computer related complaints.

#### **Required Materials**

Halderman and Mitchell (2006). *Automotive Engine Performance*. Columbus, OH: Prentice Hall Career & Technology.

#### **Learning Outcomes**

The intention is for the student to be able to:

1. Diagnose and repair Computer related drivability complaints.
2. Discern between problems caused by simple mechanical component failure/malfunction and those caused by electronic or sensor related malfunction.

#### **Learning PACT**

Through the student involvement in this course, the student will develop and document his/her achievement of the following PACT skills:

Primary skills (developed and documented):

1. Problem Solving
  - Through the application of the principles and techniques acquired in this course, the student will diagnose and repair computer related complaints. Knowledge of electrical laws and principles, sensor parameters and function allow the student to discern between component and circuit problems.
2. Critical Thinking Skills
  - Through the diagnosis of computer circuit and component problems, the student will develop critical thinking skills. The student will employ an outside-in thinking process. A logical, sequential approach must be utilized in order to repair the cause and not the symptom.

### 3. Speaking

- Through working in a team environment, the student will enhance his/her interpersonal communication skills and recognize the need for clear, concise communication between the customer and the technician to effectively analyze and repair the complaint.

### 4. Field related Technology

- Through the completion of assigned tasks, the student will develop the ability to select and utilize those tools and instruments that are appropriate for the assigned tasks. The ability to research repair procedures and service bulletins related to the complaint are further enhanced. The ability to follow diagnostic flow charts will also be demonstrated.

Secondary skills (developed but not documented):

Listening

Reading

Time Management

Ethical work practices

### **Major Summative Assessment Tasks**

These learning outcomes and primary Learning PACT skills will be demonstrated by:

1. Diagnosing and repairing customer “drivability” complaints by servicing, testing, adjusting or replacing electronic components according to manufacturer’s specifications and recommendations for diagnosing and repairing sensors and circuits.
2. In a field related environment, locating and identifying components within the computer control loop and researching service bulletins and repairing procedures required for the assigned task
3. Following all recommended safety procedures required in the performance of Computer Control systems repair.

### **Course Content**

**I. Themes** - Key recurring concepts that run throughout this course:

- A. Ethical work practices
- B. Cost Effectiveness
- C. Time management
- D. Safe working practices
- E. Communication

**II. Issues** - Key issues that will be addressed in this course: areas of conflict that must be understood in order to achieve the intended outcome:

- A. Safety when working with Electrical/Electronic Systems
- B. Communication as a tool in the diagnostic loop
- C. Technology as a research tool
- D. Responsibility for cost effective repairs
- E. Design variations

**III. Concepts** - Key concepts that must be understood to address the issues:

- A. Diagnostic Theory
- B. Flow Charts
- C. Electronic Principle
  - a. Ohms Law
  - b. Theory of Induction
  - c. Concepts of current, voltage and resistance
- D. Mechanical vs. Electronic Failure
- E. Basic Electrical Conductor Repair

**IV. Skills / Competencies** - Actions that are essential to achieve the course outcomes:

- A. Diagnose emissions or drivability problems resulting from failure of computerized engine controls with no diagnostic trouble codes stored; determine needed repairs,
- B. Retrieve and record stored diagnostic codes.
- C. Diagnose the causes of emissions or drivability problems resulting from failure of computerized engine controls with stored diagnostic codes.
- D. Inspect, test, adjust, and replace computerized engine control sensors, power train control module (P.C.M.); actuators and circuits.
- E. Obtain and interpret digital multimeter (D.M.M.) readings.
- F. Access and utilize electronic service information.
- G. Locate and interpret vehicle and major component identification numbers (V.I.N., certification labels and calibration decals).
- H. Inspect and test power and ground circuits and connections; service and repair as necessary.
- I. Practice recommended precautions when handling static sensitive devices.
- J. Diagnose drivability and emissions problems resulting from failure of interrelated systems; determine needed repairs.
- K. Diagnose emissions and drivability problems caused by failure of the E.G.R. system.
- L. Inspect and test valve, valve manifold, and exhaust passages of E.G.R. system; service and repair as necessary.
- M. Inspect and test vacuum/pressure controls, filters, and hoses of E.G.R. systems; service and repair as needed.
- N. Inspect and test electrical/electronic sensors, controls and wiring of E.G.R. systems; repair or replace as necessary.
- O. Diagnose emissions and drivability problems resulting from failure of
- P. secondary air injection and catalytic converter systems.
- Q. Inspect and test mechanical components of secondary air injection systems; service and repair as needed.
- R. Inspect and test electrical/electronically operated components and circuits of air injection systems; replace as needed.
- S. Inspect and test components of catalytic converter systems; replace as needed.

## **Learning Units**

- I. Control Component Identification and Location
- II. Control Loop Principles
- III. Testing procedures
  - a. Scanner usage
  - b. Mechanical Diagnosis
  - c. Electronic Diagnosis
- IV. Safety
- V. Information research and utilization

## **Learning Activities**

Independent and collaborative learning activities will be assigned within the classroom and lab environment to assist the student in achieving the desired outcomes. Class discussion, lecture, reading assignments and supportive lab activities will also contribute to the learning experience.

## **Grade Determination**

Grade determination will be based on the student's performance of assignments and assessment tasks within the classroom/lab environment. Attendance, group participation, and attitude toward fellow students and assigned tasks will be reflected in the final grade. Lab tasks (competencies) will be evaluated (rated) according to the competency profile.