San Bernardino Valley college
Curriculum Approved: November 17, 2003
Last Updated: September 2003

I. CATALOG DESCRIPTION:

A. Department Information:

Division:	Technical
Department:	Automotive
Course ID:	AUTO 068
Course Title:	Engine Performance - Ignition Systems
Units:	4
Lecture:	3 Hours
Laboratory:	3 Hours
Prerequisite:	None

B. Catalog and Schedule Description:
Principles of automotive engine performance covering general engine diagnosis, ignition system diagnosis and repair, and ignition related computerized engine controls. This course along with AUTO 069 will prepare students for ASE A-8 certification test.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

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

A. Identify safety requirements and recognize safety signs and symbols.
B. Describe the basic ignition system components and operation.
C. Discuss the different distributor ignition systems and explain each system's operation.
D. Compare the two types of electronic ignition systems, explain the components and operation, and service computerized and electronic ignition system.
E. Diagnose basic engine and ignition system performance test results.
F. Perform preliminary diagnostic procedure and diagnose distributor and electronic ignition system with an oscilloscope.
G. Identify ignition related computerized engine controls and how they function.
H. Demonstrate ability to perform engine performance test using various diagnostic equipment.

IV. COURSE CONTENT:

A. Shop Safety:
   1. Hazardous materials
   2. Material Safety Data Sheets
   3. Machinery hazards
B. Introduction to Ignition Systems:
   1. Terms and definitions associated with basic ignition systems
   2. Purpose of the ignition system
   3. Basic components of distributor ignition systems
   4. Characteristics of electronic ignition systems
C. Distributor Ignition System (DI):
   1. Terms and definitions associated with distributor ignition systems
   2. Switches and sending units
   3. Identify the components of breaker point ignition systems
   4. Principles of electromagnetic induction and how it relates to breaker point ignition systems
   5. How breaker point ignition systems operate
   6. Components of solid-state ignition systems
   7. Components of computerized ignition systems

8. Procedure for inspecting and testing primary circuit wiring
9. Procedure for inspecting, testing, and replacing the ignition coils in breaker point and solid-state ignition systems
10. Procedure for inspecting and replacing the distributor cap in breaker point and solid-state ignition systems
11. Removing and replacing the distributor in breaker and solid-state ignition systems
12. Procedure for disassembling, inspecting, and reassembling the distributor in breaker point and solid-state ignition systems
13. Inspecting, testing, and replacing the secondary wiring
14. Servicing spark plugs

D. Electronic Ignition System (EI) and Servicing Computerized and Electronic Ignition System:
1. Electronic ignition system is the typical operation of the system.
2. Wasted-spark electronic ignition system and how it functions
3. Identify a unit electronic ignition system and how it works
4. Advantages of an electronic ignition system
5. Difference between electronic and computerized ignition systems
6. Uses of the hall effect switch or permanent magnet signal generator
7. Procedure for testing the primary circuit wiring
8. Inspecting, testing, and replacing the coils
9. Procedure for checking timing
10. Inspecting, testing, and replacing the secondary wiring
11. Servicing the spark plugs

E. Basic Engine and Ignition System Performance Testing:
1. Terms and definitions associated with ignition system
2. Diagnosing engine condition and performance using engine vacuum gauge tests
3. Diagnosing engine condition and performance using a cranking engine compression test
4. Diagnosing engine condition and performance using a cylinder leakage test
5. Diagnosing engine condition and performance using a cylinder balance test

F. Ignition System Analysis:
1. Performing a visual engine inspection
2. Inspecting the engine exhaust
3. Components and functions of engine analyzers
4. Procedure for operating an oscilloscope
5. Identify oscilloscope patterns
6. Identify primary oscilloscope patterns
7. Identify secondary oscilloscope patterns

G. Ignition Related Computerized Engine Controls:
1. Considerations for studying computerized engine controls
2. Terminology associated with computerized engine controls
3. Identify the prerequisite knowledge needed for studying computerized engine controls systems
4. Basic characteristics of computerized engine control systems
5. Basic ignition system sensors
6. Basic characteristics and components of automotive computers
7. Permanent magnet signal generator
8. Characteristics of the hall effect sensors
9. Engine coolant temp sensor
10. Intake air temperature sensor
11. Throttle position sensor
12. Manifold absolute pressure sensor
13. Identify the characteristics of other sensors
14. Basic actuators controlled by the Engine Controlled Module (ECM)
15. Computerized control of base timing

16. Computerized control of timing advance

H. Engine Performance Tests:
1. Diagnosis an engine performance problems
2. Access and interpret diagnostic codes
3. Identify the type of diagnostic equipment
4. Identify the types of diagnostic codes
5. Procedure for checking reference voltage
6. Procedure for checking wiring continuity
7. Procedure for testing wiring with a breakout box
8. Testing the crankshaft position sensor and other magnetic position sensors
9. Testing hall effect sensors
10. Testing engine coolant temperature sensor
11. Testing intake air temperature sensors
12. Testing throttle position sensors
13. Testing manifold absolute pressure
14. Testing mass air flow sensor
15. Testing knock sensor

V. METHODS OF INSTRUCTION:
A. Lecture
B. Computer assisted instruction and shop manuals
C. Class and group discussion
D. Manufacturer's video instruction
E. Daily lab demonstrations

VI. TYPICAL ASSIGNMENTS:
A. Read assigned chapters and answer questions at the end of each chapter
Typical Question:
Compare the difference between DI and EI ignition systems.
B. Class discussion:
Typical Topic:
What are different types of Electronic Ignition Systems?
C. Videotapes:
Typical Assignment:
Take notes, outline key point of discussion.
D. Lab assignments:
Complete task sheets as per NATEF standards
Typical Assignments:
1. Perform cylinder leakage test; determine necessary action.
2. Retrieve and record stored OBD I diagnostic trouble codes; clear codes.
3. Inspect and test ignition coils; perform necessary action.

VII. EVALUATION(S):
A. Methods of evaluation:
1. Review questions
2. Quizzes (Multiple Choice, Essay, and True/False)
3. Mid-term examination (Multiple Choice)
4. Final examination (Multiple Choice and Essay)
Typical Questions:
a) List the strokes in a gasoline engine four-stroke cycle.
b) List advantages to electronic ignition systems.
c) In the past, why were computerized ignition systems considered distributor ignition systems?
d) What is the difference between a wasted-spark and unit ignition system?
5. Assigned lab task as per NATEF standards (A-8 Sections: A, B, C)
A-8 Engine Performance

Section A: General Engine Diagnosis, Task 1-10
Typical Task:
Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.

Section B: Computerized Engine Controls Diagnosis and Repair, Task 1-11
Typical Task:
Access and use electronic service information.

Section C: Ignition System Diagnosis and Repair, Task 1-9
Typical Task:
Inspect and test ignition system secondary circuit wiring and components; perform necessary action.

B. Frequency of evaluation:
1. One mid-term examination
2. One final examination
3. Weekly quizzes
4. Bi-weekly text book chapter review questions
5. Daily NATEF task assignments (Lab)

VIII. TYPICAL TEXT(S):

Chek-Chart Publications, Engine Performance Diagnosis & Tune -up, 3rd Edition, Columbus, Ohio: Prentice Hall, 1997

Don Knowles, Automotive Engine Performance, 2nd Edition, Albany, New York: Delmar Publishers, 1998

James D. Halderman, Advanced Engine Performance Diagnosis, Upper Saddle River, New Jersey: Prentice Hall, 2002

James E. Duffy, Modern Automotive Technology, Tinley Park, Illinois: Goodheart-Willcox Company, 2000

Instructional Materials Laboratory, Automotive Technology Curriculum, Module 3A, 2000 Edition CD ROM, Columbia, Missouri, 2001

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

Safety equipment, adequate clothing, four 3 1/2” computer disks