COURSE OUTLINE

Course Number  Course Title  Credits
AUT111  Automotive Service Fundamentals  5

Hours:  Co- or Pre-requisite  Implementation
lecture/Lab/Other  AUT 110  Fall 2014
2  6

Catalog description (2014-2015 Catalog):
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 stressed in detail.

Is course New, Revised, or Modified? Revised


Revision date:  Course coordinator:  Fred Bassini, Ext. 3776, bassinif@mccc.edu
August 2014

Information resources: Chrysler DealerConnect web-site, Chrysler Academy Training Reference Books, Service Manuals, On-line and CD Disc Self-study Courses and the AllData Online Service Information Database.

Other learning resources: ASE Study Guides, Automotive Related Articles Obtained From Magazines and Journals
**Course Competencies/Goals:**

*The student will be able to:*

- demonstrate his/her ability to perform automotive service and repair following protocol that promotes personal safety and the safety of others working in the repair facility or auto shop.

- explain 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.

- explain the fundamental theories of operation of automobile lubrication systems, liquid cooling systems, electronic fuel delivery systems, and electronic ignition systems.

- analyze engine cooling system, fuel system, ignition system, and lubrication system malfunctions and follow diagnostic procedures that result in the resolution of the malfunction.
  - Use diagnostic scan tools to verify proper operation of system components and identify components that are not operating within normal parameters.
  - Utilize printed and electronic service information to obtain guidance before beginning the diagnosis and/or repair of automobile systems.
  - Communicate with automotive repair professionals in a manner that follows standards of the automotive repair industry.

**Course-specific General Education Knowledge Goals and Core Skills.**

**General Education Knowledge Goals**

**Goal 1. Communication.** Students will communicate effectively in both speech and writing.

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

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

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

**Goal 5. History.** Students will understand historical events and movements in World, Western, non-Western or American societies and assess their subsequent significance.

**Goal 6. Diversity.** Students will understand the importance of a global perspective and culturally diverse peoples.

**Goal 7. Ethical Reasoning and Action.** Students will understand ethical issues and situations.

**MCCC Core Skills**

**Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

**Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.

**Goal C. Ethical Decision-Making.** Students will recognize, analyze and assess ethical issues and situations.

**Goal D. 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.

**Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.

**Goal F. Collaboration and Cooperation.** Students will develop the interpersonal skills required for effective performance in group situations.

**Goal G. Intra-Cultural and Inter-Cultural Responsibility.** Students will demonstrate an awareness of the responsibilities of intelligent citizenship in a diverse and pluralistic society, and will demonstrate cultural, global, and environmental awareness.

**Units of study in detail.**

**Unit I: SHOP AND EQUIPMENT SAFETY**

**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.

A. IMPORTANCE OF SHOP SAFETY
   a. Everyone’s Responsibility/Think Safety
   b. Safety Glasses/Eye Protection
   c. Cleanliness
   d. Clothing

B. KNOW THE LAYOUT OF THE AUTO SHOP
   a. Electrical Power Interrupt (Kill-Buttons) Switches
   b. Fire Extinguishers
   c. First Aid Kits
   d. Fire Blankets
   e. Fire Drill Procedures

C. WHAT TO DO IF AN ACCIDENT OCCURS
   a. Student
   b. Instructor / TA

D. RUNNING AN ENGINE IN THE SHOP
   a. Carbon Monoxide
   b. Exhaust Hoses
   c. Shop Exhaust System

E. FIRE PREVENTION
   a. Fire/Fire Extinguisher Classification
   b. Handling Flammables
   c. Handling Oily Rags/Spontaneous Combustion

F. ASBESTOS BRAKE DUST
   a. Hazards/Handling/Removal Procedures

G. COMPRESSED AIR
   a. Eye and Ear Damage
   b. Safety When Using Quick Disconnect Air Tool Fittings

H. USING WORK LIGHTS (TROUBLE LIGHTS)
   a. Heat Emitted From Light
   b. Change of Starting a Fire

I. USING HAND TOOLS
   a. Cleanliness
   b. Proper Handling
   c. Maintenance
   d. Using the Correct Tool For the Job

J. USING POWER TOOLS
   a. Electric or Compressed Air
   b. Safety Guards

K. USING HYDRAULIC JACKS AND LIFTS
   a. Vehicle Lifting Areas
   b. Jack Stands
   c. Equipment Safety Locks

L. HANDLING AND STORAGE OF AUTOMOTIVE BATTERIES
   a. Explosion Hazards
   b. Acid and Handling
   c. Jump-Starting Procedures

M. SUPPLEMENTAL RESTRAINT SYSTEMS (SRS)
   a. Disabling SRS systems
   b. Precautions/Handling/Storage
N. EMPLOYEE AND STUDENT RIGHT-TO-KNOW
   a. OSHA Regulations
   b. Material Safety Data Sheets (MSDA)

Unit II   BASIC HAND TOOLS AND USAGE
Learning Objectives
The student will be able to...
   • demonstrate their ability to adhere to safety procedures while using or working around hand tools
   • explain which tool should be used for a specific service or repair process/describe the uses of basic hand tools
   • analyze basic hand tools to determine if they are damaged or worn and must be removed from service to prevent injury and damage to automotive components.

A. IMPORTANCE OF USING THE PROPER TOOL FOR THE JOB
   a. Efficiency and Safety
   b. Metric or Standard

B. HAND TOOLS
   a. Any tool that is powered by the human hand

C. WRENCHES
   a. Open-End
   b. Box-End
   c. Combination
   d. Socket/Drives and Attachments
      i. Six and Twelve Point
      ii. Drive Sizes
      iii. Types of Sockets
      iv. Extensions
      v. Universals/Swivels
   e. Torque Wrenches
      i. Types
      ii. Care and Handling
      iii. Calibration
   f. Adjustable Wrench
   g. Allen (Hex) Wrenches
   h. Torx Tip Drive Tools

D. SCREW DRIVERS
   a. Common or Straight
   b. Phillips
   c. Special Purpose
   d. Proper Selection

E. PLIERS
   a. Slip-Joint
   b. Diagonal Cutting
   c. Needle-Nose
   d. Special Purpose
   e. Locking

F. HAMMERS
   a. Safety and Handling
   b. Types
      i. Ball-Peen
      ii. Dead-Blow
G. PUNCHES AND CHISELS
   a. Proper Selection
   b. Types
   c. Safety and Maintenance

H. FILES
   a. Usage
   b. Handling Procedures
   c. Types

I. HACKSAWS
   a. Proper Usage
   b. Blade Selection and Blade Service

J. TWIST DRILLS
   a. Proper Method of Drilling
   b. Left-Hand and Right-Hand Drill Bits
   c. Drill and Drill Bit Maintenance

K. SHOP POWER TOOLS
   a. Hand Drill/Drill Press
   b. Grinder/Wire Wheel
      i. Stone Maintenance
      ii. Wire Wheel Quality
      iii. Material Selection
   c. Air Wrenches/Impact Guns
   d. Air Chisels
   e. Cut-Off Tools
   f. Proper Usage

Unit III  FASTENERS AND THREAD REPAIR

**Learning Objectives**

_The student will be able to..._

- analyze fasteners and determine the fastener's size and thread design.
- explain what fasteners should be used for various applications and determine what grade fastener should be used in different applications.
- demonstrate the most efficient way to remove a broken or seized fastener and be able to demonstrate the proper way to repair damaged fastener threads.

A. TYPES OF THREADED FASTENERS
   a. Screws
      i. Cap
      ii. Machine
      iii. Allen Head
      iv. Self-Tapping
   b. Bolts
      i. Cap
      ii. Machine
      iii. Square Head
      iv. Carriage
   c. Studs
   d. Nuts
      i. Hexagonal
i. Square
ii. Lock Nut
iv. Castellated

E. Washers
i. Flat
ii. Locking – Split, Star

B. THREAD SIZES AND DESIGNATIONS
   a. English System Threads
      i. NC – National Course, NF – National Fine
      ii. Fastener Diameter
      iii. Fastener Length
   b. Metric System Threads
      i. Fastener Diameter – Metric Management
      ii. Pitch in Millimeters
   c. Using a Pitch Gauge
   d. Grade Markings
      i. English
      ii. Metric

C. EXTRACTING BROKEN FASTENERS
   a. Left-Handed Drills
   b. Heat
   c. Penetrating Lubricant
   d. Extractors

D. REPARING DAMAGED THREADS
   a. Tap/Die Usage
   b. Thread Repair Inserts
   c. Thread Chasers

E. NON-THREADED FASTENERS
   a. Dowel Pins: Straight, Tapered, Split
   b. Retaining Rings (Snap Rings)
   c. Keys
   d. Splines
   e. Rivets
   f. Glue/Adhesive/Zip-Ties

Unit IV UNDER HOOD/UNDER CAR INSPECTION

Learning Objectives
The student will be able to...
• utilize printed and electronic automotive service information to access data related to specifications and service procedures.
• demonstrate his/her ability to locate safety and functionality concerns found during routine vehicle maintenance.
• provide recommendations to customers regarding needed vehicle repairs and service found necessary during a safety inspection.

A. VEHICLE IDENTIFICATION PROCEDURES
   a. Understanding the Vehicle Identification Number (VIN)
   b. Using a Vehicle Service Manual (Printed and Electronic Manuals)

B. UNDER HOOD INSPECTIONS
   a. Purpose
   b. Components
      i. Fluid Levels
         1. Engine Oil
2. Automatic Transmission (Early and Some Late Model)
3. Power Steering
4. Coolant
5. Brake Master Cylinder
6. Clutch Master Cylinder
7. Battery Water Level (If Applicable)
8. Windshield Washer
   ii. Accessory Drive Belts – Condition and Tension
   iii. Condition of Hoses – Vacuum and Coolant
   iv. Loose or Worn Components
C. UNDER CAR INSPECTION
   a. Identifying Fluid Leaks
      i. Fluid Colors
      ii. Dyes and Additives
      iii. Ultra-Violet Light Inspection
   b. Fluid Levels
      i. Manual Transmission and Transfer Case
      ii. Automatic Transmission (Some Late Model)
      iii. Differential (Front and Rear)
   c. Areas for Fluid Leaks
      i. Lower Engine
      ii. Transmission
      iii. Axle – Differential or Transaxle Seal
      iv. Rack and Pinion Unit
      v. Shock Absorbers
      vi. Fuel Lines, Filter, Tank, and Pump
      vii. Brake Lines
   d. Other Inspection Components
      i. Tires
      ii. Steering System Linkages
      iii. Suspension Components
      iv. Universal Joints
      v. Constant Velocity Joints
      vi. Exhaust System
      vii. Under Body – Floor Panels, Body Mounts, etc.

Unit V  INTRODUCTION TO AUTOMOTIVE REPAIR FACILITIES

Learning Objectives
The student will be able to...
• demonstrate the proper way to document diagnostics and service repair procedure on repair orders.
• locate appropriate diagnostic and repair procedures using printed and electronic vehicle service information.
• explain the purpose and general operation of most for-profit automotive repair departments.

A. PERFORMANCE STANDARDS
   a. Service Department Standards
   b. Technician Performance Standards
B. SERVICE INFORMATION
   a. Service Manuals
      i. Special Tools
      ii. Diagnostic Procedures Manuals
      iii. Technical Service Bulletins (TSB’s)
      iv. Special Service Messages (SSM’s)
      v. Recall Notices
   b. Diagnostic Tools
i. Manufacturer-Specific Scan Tools
ii. Generic Scan Tools
iii. Service Publications (Printed and Electronic)
iv. DealerConnect (Chrysler)
v. AllData (Comprehensive)

C. TROUBLESHOOTING
   a. Six Step Troubleshooting Procedure
   b. Diagnostic Trouble Codes (DTC’s)
   c. Where to Find technical Assistance

D. LABOR OPERATIONS AND REPAIR ORDERS
   a. Repair Order (R.O.) Formatting
   b. Failure Codes
   c. Labor Operations/Time Schedule/Technician Flat-Rate Compensation
   d. Warranty Coverage and Warranty Procedures

E. CUSTOMER SATISFACTION
   a. Customer Satisfaction Index (CSI)
   b. Customer Arbitration Boards
   c. Lemon Laws

F. TECHNICAL TRANING
   a. Chrysler Academy Training Requirements (CAP)
   b. Computer-Based Training (CBT)
   c. Comprehensive-Track Supplemental Training requirements
   d. Automotive Service Excellence (ASE) Testing and Certification

Unit VI   NEW AND USED VEHICLE PREPARATION PROCEDURES

Learning Objectives
The student will be able to...
• demonstrate their ability to accurately perform safety and functionality inspections of new and used automotive systems and components prior to customer taking delivery of the vehicle.
• follow warranty procedures to resolve issues found during new vehicle preparation.
• analyze a used vehicle to evaluate repairs and/or services that are needed before the vehicle is sold to a customer.

A. THE IMPORTANCE OF A CAREFUL NEW AND USED VEHICLE PREPARATION
   a. Customer Safety
   b. Customer Satisfaction

B. UNDER HOOD CHECKS
   a. Hood Latch and Safety Latch Adjustments
   b. Engine Oil Level
   c. Automatic Transmission Fluid Level
   d. Brake and Clutch Master Cylinder Fluid Level
   e. Power Steering Fluid Level
   f. Windshield Washer Fluid Level
   g. Coolant Level
   h. Fluid Lines and Connections
   i. Electrical Wiring Connections and Routing
   j. Battery Condition and Battery Terminal Cable Connections
   k. Accessory drive belt(s) and Hoses Condition (Used Vehicle)

C. BODY CHECKS
   a. Exterior Lighting
   b. Check Operation and Alignment of Components
      i. Adjustments
c. Door and Window Sealing
d. Operation of Interior Accessories
e. Wiper Blade Condition (Front and Rear) (Used Vehicle)
f. Seat Adjusters and Latches
g. Occupant Restraints and Head Restraints
h. Paint Touch-Up Techniques
   i. Paint
      ii. Blending
D. UNDER VEHICLE
   a. Check For Loose Components and Installation of Cotter Pins
   b. Differential Fluid Levels
   c. Manual Transmission and Transfer Case Fluid Levels
   d. Fluid Lines, Hoses, and Connections
   e. Fluid Leaks
   f. Exhaust System
   g. Brake System Evaluation (Used Vehicle)
h. Worn Components (Used Vehicle)
E. TIRES
   a. Condition
   b. Setting Tire Pressures
      i. Calibrating Tire Pressure Monitoring Sensors (TPMS) (Where Applicable)
   b. Lug Nut Torque
F. INSTALLING ITEMS THAT WERE SHIPPED LOOSE
   a. Floor Mats
   b. Wheel Covers
   c. Roof Rack Bars
   f. Front License Plate Holders
G. ROADTEST
   a. Clutch or Neutral Start Switch Operation/Adjustment
   b. Instrument Panel Cluster and Gauges
   c. Instrument Panel Controls
d. Wipers and Washers (Front and Rear)
e. A/C, Heater, and Defroster Systems
g. Brake and Parking Brake Operation
   i. Parking Brake Adjustment
h. Engine/Transmission Performance
I. Steering Control
j. Vibrations and Rattles/Noise Vibration and Harshness Concerns (NVH)
H. CLEANING VEHICLE/APPEARANCE
   a. Wash Off All Road Grime
   b. Remove All Shipping Stickers
   c. Clean All Glass
d. Remove All Excess Sealers, Undercoating, and Weatherstrip Adhesive
I. NEW AND USED VEHICLE PREPARATION FORM
   a. Documentation of Inspection Results
   b. Technician Signature and Date of Inspection

Unit VII   FUNDAMENTALS OF THE INTERNAL COMBUSTION ENGINE

Learning Objectives
The student will be able to...
• explain the 4-cycle theory
• explain the purpose and operation of internal engine components
• describe the difference between the combustion process that takes place in gasoline and diesel engines

A. INTERNAL AND EXTERNAL COMBUSTION
   a. Laws Governing Engine Combustion
      i. Pascal’s Law
      ii. Boyle’s Law
      iii. Charles’ Law
   b. Cannon Principle
      i. Essential Components
      ii. Reciprocating and Rotary Motion

B. FOUR-CYCLE THEORY
   a. Intake
      i. Volumetric Efficiency
      ii. Valve Overlap
   b. Compression
      i. Combustion Temperature
      ii. Temperature vs. Pressure
         1. Spontaneous Combustion
         2. Pressure Controlled by Chamber Design
   c. Power
      i. Combustion Pressure
   d. Exhaust
      i. Cylinder Pressure Exhaust Evacuation

C. ENGINE COMPONENTS
   a. Engine Block/Cylinders
      i. Cylinder Configurations
      ii. Construction
   b. Piston/Connecting Rod/Rings
   c. Crankshaft/Flywheel
   d. Cylinder Head
      i. Chamber Designs
      ii. Combustion Abnormalities
   e. Valve Train Components
      i. Valves/Springs
      ii. Camshaft
      iii. Lifters/Push Rods/Rocker Arms
      iv. Timing Belt or Chain
   f. Intake and Exhaust Manifolds

D. ENGINE SIZE AND PERFORMANCE MEASUREMENT
   a. Displacement
      i. Bore and Stroke
      ii. Compression Ratio
   b. Horsepower
   c. Torque

E. ENGINE CONDITION DIAGNOSIS
   a. Compression Test (Engine Cranking and Engine Running Test)
   b. Cylinder Leakage Test
   c. Vacuum Test
   d. Power Balance Test (Performed When Applicable With Scan Tool)
Unit VIII  SYSTEM FUNDAMENTALS

**Learning Objectives**

*The student will be able to...*

- explain the function and operation of modern liquid cooling systems used in the design of late model automobiles.
- analyze the operation of liquid cooling systems and determine the root cause of system malfunctions.
- explain the importance of proper maintenance for engine cooling and lubrication systems.
- demonstrate his/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.

A. **LUBRICATION/OILS**
   a. Functions of Lubrication
      i. Reduce Wear and Power Loss
      ii. Cooling Through Heat Transfer
      iii. Shock Absorption
      iv. Sealing
      v. Cleaning
   b. Characteristics of Lubricants
      i. Cohesion
      ii. Viscosity and Viscosity Index Rating – SAE
      iii. Service Rating – API
      iv. Qualities (Additives)
      v. Deterioration
      vi. Contamination
      vii. Breakdown
      viii. Polymerization
      ix. Long-Interval Oils
      x. Synthetic Oils
   c. System Components and Oil Flow
      i. Oil Pan
      ii. Oil Pump and Pick-Up
      iii. Oil Filter and Adaptor
      iv. Galleries and Passages
      v. Oil Leak Diagnosis
      vi. Oil Pressure Indicators
   d. Lubrication System Service
      i. Oil Analysis
      ii. Performing and Oil Filter Change
      iii. Proper Disposal of Waste Oil
      iv. Chassis Lubrication

B. **COOLING/COOLANTS**
   a. Introduction to Cooling
      i. Air and Liquid Cooling Systems
   b. Coolant Properties
      i. Proper Dilution of Concentrated Antifreeze
      ii. Extended Life Coolant
      iii. Ethylene-Glycol vs. Propylene-Glycol
   c. System Components
      i. Water Pump
ii. Thermostat

iii. Hoses and Tubes

iv. Radiator
   1. Pressure Cap
   2. Pan
   3. Coolant Recovery Bottle

v. Temperature Monitoring System

d. Cooling System Service
   i. System Testing
   ii. Component Check and Adjustments
   iii. Coolant Exchange/Flushing Procedures
      1. Front Wheel Drive
      2. Rear Wheel Drive

C. FUEL/EMISSIONS CONTROL

a. Introduction to Vehicle Emissions

b. Fuel System Components
   i. Fuel Characteristics
      1. Refining
      2. Octane Rating
      3. Volatility
      4. Additives
   ii. Fuel Related Drivability Problems
      1. Fuel Tank/Cap
      2. Fuel Pump
      3. Fuel Filter and Service

c. Carburetor or Throttle Body Injection
   i. Functions and Basic Theory of Operation
   ii. Service Procedures
   iii. Multi-Point E.F.I.
   iv. Sequential
   v. Theory of Operation
   vi. Air Cleaner

d. Fuel System Troubleshooting
   i. Visual Inspection
   ii. Fuel Pump Tests
      1. E.F.I. Equipped Systems
   iii. Separating Quick – Disconnect Fittings

D. IGNITION SYSTEMS

a. Introduction to the Ignition System
   i. Primary Ignition
   ii. Secondary Ignition

b. Point Ignition System
   i. Operation and Construction

c. Electronic Ignition System (EIS)
   i. System Components
   ii. Electronic Control Unit (ECU)
   iii. Switching Device

d. Ignition System Components
   i. Ballast Resistor
   ii. Ignition Coil
   iii. Distributor Cap
   iv. Secondary Wires
   v. Spark Plugs
Unit IX  ELECTRONIC IGNITION SYSTEMS (EIS)

Learning Objectives
The student will be able to...
• explain electronic ignition system design and operation.
• analyze an electronic ignition system and determine the type electronic ignition system install on a vehicle.
• demonstrate his/her ability to diagnose and repair malfunctions in an electronic ignition system.
• explain the advantages of electronic ignition systems compared to mechanical ignition systems.

A. HALL EFFECT EIS
   a. System Description and Operation
   b. Shutter Continuity Check
   c. Scope Pattern
   d. System Diagnosis
      i. Output Check
      ii. Voltage Check
      iii. Distributor Connector and ECU Continuity Check
      iv. Hall Effect Pick-Up Check

B. ELECTRONIC SPARK CONTROL SYSTEMS
   a. Electronic Fuel Injection
      i. Description/Operation/System Components
      ii. Diagnostic Procedures
      iii. Base Timing and Spark Advance Checks
   b. Photo Sensor – Optical Ignition System
      i. Description/Operation/Components
      ii. Diagnostic Procedures
      iii. Component Service
   c. Distributor-Less Ignition System
      i. Description/Operation/Components
      ii. Diagnostic Procedures
      iii. Component Service
   d. Direct Ignition System
      i. Description/Operation/Components
      ii. Diagnostic Procedures
      iii. Component Service

C. USING SCAN TOOLS FOR IGNITION DIAGNOSIS
   a. Stand-Alone Scan Tool
   b. Scan Tool With Ignition System Testing Adaptors

Unit X  INTRODUCTION TO DIAGNOSTIC SCAN TOOLS

Learning Objectives
The student will be able to...
• identify vehicle on-board-diagnostic system types.
• analyze data stream information via scan tool readings and determine possible sources of system malfunctions.
• demonstrate his/her ability to read and erase diagnostic trouble codes (DTC’s) stored in vehicle control modules.

A. TYPES OF DIAGNOSTIC SCAN TOOL
   a. Manufacturer-Specific (Chrysler)
      i. DRB II
      ii. DRB III
      iii. Star Scan
      iv. Star Mobile
   b. Generic
      i. Snap-on Ethos
      ii. Snap-on Solis
      iii. Others
      iv. Stand-Alone Code Readers

B. ON-BOARD-DIAGNOSTIC
   a. OBDI
      i. Lack of Comprehensive Component Monitors
      ii. Detection of Failed Components Only
      iii. No Detection of Failure Type
   b. OBDII
      i. Addition of Comprehensive Component Monitors
      ii. Detect Worn Components
      iii. Detection of Failure Type
   c. Vehicle Communication Networking
      i. Data Sharing
      ii. Data Stream Information

C. CONNECTING THE SCAN TOOL TO THE VEHICLE
   a. Diagnostic Connectors
      i. Location
         1. Each Manufacturers’ Location
         2. Standardization of Location
      ii. Data Link Connector (DLC)
   b. Scan Tool Cables
      i. Specialized Diagnostic Connectors (OBDI)
      ii. Standardized 16-Pin Diagnostic Connector (OBDII)
   c. Powering On the Scan Tool
      i. On/Off Button
      ii. Powered On When Connected to the Vehicle
   d. Checking For Codes (DTC’s)
      i. Reading DTC’s
      ii. Erasing DTC’s
   e. Computer Diagnostics
      i. Data Display
      ii. Output Tests
      iii. Wiggle Test
      iv. Actuator Commands
      v. Troubleshooter
      vi. Program Cartridge
      vii. Adaptors and Keys
   f. Failure Types
      i. Hard Failure
      ii. Soft Failure
iii. General Circuit Failure
iv. Low-Input Failure
v. High-Input Failure
vi. Improper Range/Performance Failure
g. Diagnostic Trouble Code (DTC) Identification
   i. Standardized Alpha-Numeric Trouble Codes
   ii. Non-Uniform Trouble Codes
   iii. Fault Designation
   iv. Decoding DTC's

**Unit XI**

**COURSE REVIEW/FINAL EXAM**

A. SHOP AND EQUIPMENT SAFETY
B. BASIC HAND TOOLS AND USAGE
C. FASTENERS AND THREAD REPAIR
D. UNDER HOOD/UNDER CAR INSPECTION
E. INTRODUCTION TO AUTOMOTIVE REPAIR FACILITIES
F. NEW AND USED VEHICLE PREPARATION PROCEDURES
G. FUNDAMENTALS OF THE INTERNAL COMBUSTION ENGINE
H. SYSTEM FUNDAMENTALS
   a. Lubrication/Oils
   b. Cooling/Coolant
   c. Fuel and Emissions Control
   d. Ignition Systems
I. ELECTRONIC IGNITION SYSTEMS (EIS)
J. INTRODUCTION TO DIAGNOSTIC SCAN TOOLS

**Evaluation of student learning:**

A. Lab Work  40%
B. Test/Quizzes/Homework Assignments/Final Exam  60%

**Academic Integrity Statement:**
Mercury County Community College is committed to Academic Integrity-- the honest, fair and continuing pursuit of knowledge, free from fraud or deception. This implies that students are expected to be responsible for their own work, and that faculty and academic support services staff members will take reasonable precautions to prevent the opportunity for academic dishonesty.

**Reasonable Accommodations for Students with Documented Disabilities**

Mercury 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 or urbanb@mccc.edu.