

Curriculum for first semester “Mechanics with Mike”

Basic Internal Combustion Engines

Instructor: Mike Viguera

Safety

1. Shop safety
 - a. keeping the shop safe
 - b. electrical hazards
 - c. safe use of hand tools
 - d. adjustments and replacements of tool components
 - e. safety equipment
 1. location of fire extinguisher and first aid kit
 2. location of hazardous materials locker (paints, solvent, oils)
 - f. how to identify hazardous chemicals and materials
 - g. adjustments and replacements of tool components
2. Personal Safety and protective equipment
 - a. eye wear
 - b. hand protection
 - c. face and body protection for grinding, cleaning, welding
3. Using the proper tool for the job.

Tools and Bolts

1. Tool identification
 - a. Wrench and socket sizes, standard and metric
 - b. Measurement tools: vernier caliper, dial indicator, standard ruler to 32nds
 - c. What specific tools are needed for minor repairs on the most basic equipment
2. Bolts
 - a. Identify bolt grade
 - b. Wrench sizes for bolts
3. Choosing the correct tool for specific applications

General information: What makes an engine run?

1. The 4-stroke Internal Combustion Engine
 - a. The 4-stroke cycle design, used in automobiles, aircraft, trucks, and tractors:
 - b. The necessary components needed to make an engine run:
 - c. How to trouble shoot an engine that won't run
 - d. How to make minor repairs
2. The different types of Internal Combustion Engines
 - a. Most basic: single-cyl, two-valve, ICE
 - b. 2 cyl, 3 cyl, 4 cyl, 5 cyl, 6 cyl, 8 cyl, 10cyl,16 cyl engines
3. Diesel Engine
 - a. How it works
 - b. Application of the diesel engine in the industry and why it is so widely used
 - c. Minor care and maintenance of the diesel engine

Hands-on portion of class

1. Complete analysis of a single cylinder engine
2. Complete dismantling and reassembling of a single cylinder engine
 - a. Check each component for normal/abnormal wear patterns
 1. The use and application of tools to measure items that commonly show wear
 2. Learn allowable parameters of wear, as well as the application of needed repairs
 3. Practice a concise approach with measuring devices to analyze each worn component
 4. Steps for proper replacement of seals and gaskets
 - b. Final assembly of the engine
 - c. Start up and bench test

Note: as the class progresses, more time will be dedicated to the lab, hands on, disassembly and re-assembly.

Basic Automotive Electrical System

1. What happens when you turn the key “on”?
 - a. The wet cell battery and a basic overview of what makes it work.
 - b. Where does the current go when it leaves the battery?
 - c. Tracing current flow for the purpose of troubleshooting
2. Use of the Test Light for basic problem solving
3. The basic ignition system used in small equipment and the standard automobile
4. Electrical safety on low voltage Direct Current (DC) systems, as in most automobile applications
 - a. Batteries and related electrical components
 - b. Low voltage (12, 24, and 36 Volt) systems
5. Trouble shooting lighting, ignition problems, and electrical accessories

The Volt Meter

1. When we don't need a volt meter
2. When we will need a volt meter
3. How volt/ohm meters are used
 - a. Application
 - b. Safety
 - c. Troubleshooting
 - d. Choosing the right meter for you

A Basic Tool Kit

1. What is needed for minor repairs on the most basic equipment
 - a. Specific Tools
 - b. Identify the tool by size and application
2. Know your tools
 - c. Learn your sizes, wrenches, sockets, etc.
 - d. Learn both METRIC and STANDARD as they apply to the job.

Added Notes:

- Materials required: Basic tools needed for minor repairs, safety glasses
- Optional materials: gloves, shop coat, apron or coveralls
- A good amount of “Hands-On” instruction will be applied along with the classroom (shop) instruction. There will be sessions, especially as we progress in the basic learning, that will use the entire two hour timeframe working in the shop/lab.
- At the end of each two hour class, a short oral or written quiz will given on that day's instruction
- There will be some homework required.