Course Outline

CONTENT

A. Introductory Principles
   1. Hybrid and Electric Vehicle Vocabulary
   2. Hybrid and Electric Vehicles in Production
   3. Types of Hybrid Systems – Architecture of Basic Hybrid (HEV)
      a. Series.
      b. Parallel.
      c. Series.
      d. Series/Parallel.
      e. Mild and Assist Hybrids.
      f. Plug-in Hybrids
   4. Electrical Theory Basics – Architecture of Electric Vehicle (EV)
      a. Electrical Basics.
      b. Safety Implications.

B. Motor and Generator Basics
   1. Basic Hybrid Motor Operations
      a. Series.
      b. Parallel.
   2. Generators
   3. Motor Generators
   4. Controllers
C. Battery Basics
   1. Lead-Acid (Pb-A)
   2. AGM Battery (12 volt system)
   3. High-Voltage (HV) System Batteries
      a. NiMH
      b. Li-Ion and other new battery technologies
      c. Importance of HV State-of-charge.
   4. Battery pack control component diagnosis and repair

D. Hybrid System Components and Operation
   1. System Components
      a. MG
      b. Battery Pack
      c. Rectifiers, Inverters, Converters
      d. Cables, Switches
   2. Battery Charging
   3. Regenerative Braking
   4. Hybrid transaxle drive operations
   5. Advanced HEV and EV onboard diagnostic data, diagnosis and repair
   6. Driving

E. Safety Practices. (Not OSHA or State mandated)
   1. Personal Safety, Personal Protective Gear (PPG)
   2. Gloves
   3. Tools and Equipment
      a. Mega-ohm meter.
      b. Scanners (e.g., Toyota TIS).
      c. Using appropriate fluids.
   4. Safety Procedures (Shop)
      a. Depowering High Voltage (HV) System
      b. Importance of ensuring auto in shutdown mode.
      c. Repowering HV System
   5. Safety Procedures (Test Driving)
(Note: Emphasis on F or G will depend on specific vehicles available)

**F. Honda and/or GM (Mild Hybrid) Systems**
1. Routine Maintenance (unique to this type of hybrid system)
   a. System-specific Fluids
   b. Inverter Cooling systems
   c. Coolant Heat Storage systems
   d. 12-volt charging system operations
   e. Other System-specific requirements (e.g., Brakes).
2. Diagnostics (for Hybrid-system related problems)
   a. Types and use of test equipment
   b. Reading data codes, Interpreting diagnostic data
   c. Assuring proper use of fluids
3. Methods of repair

**G. Toyota and/or Nissan (Full Hybrid) Systems**
1. Routine Maintenance (unique to this type of hybrid system)
   a. System-specific Fluids.
   b. Inverter Cooling Systems
   c. Coolant Heat Storage systems
   d. 12-volt charging system operations
   e. Other System-specific requirements (e.g., Brakes).
2. Diagnostics (for Hybrid-system related problems)
   a. Types and use of test equipment
   b. Reading data codes, Interpreting diagnostic data
   c. Assuring proper use of fluids
3. Methods of repair