e. Perform basic “in-car” diagnostics and repairs.
f. Understand the basic concepts and procedures to successfully rebuild late model transmissions and transaxles.

OUTLINE OF INSTRUCTION:

I. Basic Gear Systems Theory
   A. Speed versus Torque
   B. Gear Ratios

II. Planetary Gear Systems
   A. Construction
   B. Principles of Operation
      1) Rules of planetary gears
      2) Typical transmission power flow
      3) How various ratios can be obtained (including overdrive)
      a. Hold one member
      b. Drive two members
      c. Neutral
      4) Compound Planetary (Simpson and Ravigneaux)
      a. Used in pairs or as a multiple unit
      b. Operation

III. Friction Elements
   A. Basic Principles of Hydraulics
   B. Hydraulic System Components (Identification of Parts and Operation)
      1) Reservoir (sump)
      2) Pump
      3) Valving
         a. Pressure regulator
         b. Manual valve
         c. Governor valve
         d. Shift valve
         e. Throttle modulator valve
         f. Down-shift valve (detent)
         g. Scheduling valve
         h. Orifice control valve
         i. Cut-back valve
         j. Relief valve
         k. Accumulator valve
         l. Non-return valve (ball)
         m. Converter check valve
   C. Torque Converters
      1) Elements of the converter
      2) Principles of converter operation
      3) Stator
      4) Converter hydraulic circuit
      5) Lock-up (be familiar with various methods)
   D. Fluids
      1) Types

2) Recommended Applications
E. Bands, Clutches, One-Way Clutches
F. Servos

IV. Transmission/Transaxle Maintenance and Adjustments
A. Oil Level and Condition
B. Linkage Adjustments
1) Manual
2) Throttle, kickdown, and accelerator pedal
3) Neutral start systems
4) Gear select indicator
5) Cable for throttle valve (TV) kickdown and pedal
C. Fluid/Filter
1) Filter Service
2) Fluid Exchange
D.

P. Converter
   1) Stall testing procedures
   2) Slipping one-way clutch/frozen stator
   3) Overheating
Q. Tests/Diagnostic Procedures
   1) Road testing (determine shift points)
   2) Pressure (test plug location)
   3) Vacuum
   4) Air (clutch pack and servo operation)

VI. Electronic Automatic Transmission Diagnostics/Testing
A. Diagnostic Trouble Codes
   1) Retrieving
   2) Interpreting
   3) Following Diagnostic Trouble Code Charts
B. Testing of Inputs
   1) Switches
   2) Throttle Position Sensor
   3) Mass Airflow or Manifold Absolute Pressure Sensor
   4) Temperature Sensors
   5) Speed Sensors
   6) Range Sensors
   7) Governor Sensors
C. Testing of Actuators
   1) Shift Solenoids
   2) Pressure Control Solenoids
   3) Torque Converter Clutch Solenoids
   4) Torque Converter Clutch Pulse Width Modulated Solenoids

VII. Transmission/Transaxle Repair Procedures (In-Vehicle)
A. Fluid Leaks
   1) Oil Pan
   2) Seals
B. Mounts
C. Cooler Lines
D. Electrical Connections
E. Replacement of Sensors
F. Driveshaft/Driveaxles
G. Extension Housing

VIII. Transmission/Transaxle Off-Vehicle Repair
A. Required End-Play and Clearance Checks
B. Inspection/Assembly of Components
   1) Foreign material in pan
   2) Gears (sun, ring, and carrier assembly)
   3) Pumps (including housings)
   4) Bands and clutches
   5) Machined surfaces
   6) Control valves

8) Turbine shaft
9)