

## SYLLABUS

Division: Business & Engineering Technologies      REVISED: Spring 2012  
Curricula in Which Course is Taught: Automotive Analysis & Repair Curriculum  
Course Number and Title: AUT 178 Manual Transmission & Final Drive Systems  
Credit Hours: 4      Lecture Hours/Week: 4      Laboratory Hours/Week: 3

**I. Course Description:**

Provides instruction in the operation, design, construction, and repair of manual transmissions and final drive systems. Includes automotive clutches, transaxles, drive axles, driveshafts differentials and the principles of gear reduction.

**II. Relationship of the course to curriculum objectives:**

- I. demonstrate technical competencies in manual transmissions and final drive systems
- II. demonstrate punctuality and reliability acceptable to the automotive repair trade
- III. use safety equipment and procedures required for the tasks being performed
- IV. read and interpret technical information required for projects and assignments
- V. demonstrate and maintain a clean, orderly, safe and attractive work place

**III. Requirements:**

The student must have completed the courses in the Automotive Analysis & Repair curriculum that precede this class, or have the instructor's permission in order to take this class. Each student must have a basic tool set and work clothes available each day.

**IV. Course Objectives-ASE task list:**

Identify and interpret drive train concern; determine action  
Research applicable vehicle and service information  
Locate and interpret vehicle and component identification numbers  
Diagnose fluid usage, level and condition; determine action  
Drain and fill manual transmission/transaxle and final drive unit  
Diagnose clutch noise, binding, slippage, pulsation and chatter  
Inspect clutch pedal linkage, cables, adjusters, brackets, pivots, etc.  
Inspect hydraulic clutch slave and master cylinders, lines and hoses  
Inspect release bearing, lever and pivot  
Inspect and replace pressure plate and clutch disc  
Bleed clutch hydraulic system  
Inspect, remove or replace pilot bearing  
Inspect flywheel and ring gear for wear; determine action  
Inspect block, bell housing and transmission case mating surfaces  
Measure flywheel runout and crankshaft endplay; determine action  
Remove and reinstall transmission/transaxle  
Disassemble, clean and reassemble transmission/transaxle  
Inspect transmission case, extension housing, mating surfaces, etc.  
Diagnose noise, hard shifting, jumping out of gear, fluid leakage concerns  
Inspect, adjust and reinstall shift linkage, brackets, bushings, etc.  
Inspect and install powertrain mounts  
Inspect and replace gaskets, seals, and sealant and inspect sealing surfaces  
Remove and replace transaxle final drive  
Inspect, adjust and reinstall shift cover, forks, levers, grommets, etc.  
Measure endplay or preload on transmission/transaxles shafts  
Inspect and reinstall synchronizer assemblies  
Inspect and reinstall speedometer drive assemblies or sensors  
Diagnose transaxle final drive noise and vibration  
Remove, inspect, measure and adjust transaxle final drive assemblies  
Inspect lubrication devices: pumps or slingers

Inspect, test and replace transmission sensors or switches  
 Diagnose CV joint noise and vibration concerns  
 Diagnose u-joint noise and vibration concerns  
 Replace FWD wheel bearing  
 Inspect, service and replace shafts, yokes, boots and CV joints  
 Inspect, service, and replace center support bearings  
 Check shaft balance; measure run-out; measure and adjust driveline angles  
 Diagnose ring gear noise and vibration concerns  
 Diagnose differential fluid leakage concerns  
 Inspect and replace companion flange and pinion seal  
 Inspect ring gear and measure run-out  
 Remove, inspect and reinstall ring and pinion assembly  
 Measure and adjust pinion depth  
 Measure and adjust pinion bearing preload  
 Measure and adjust side bearing preload and ring and pinion backlash  
 Check ring and pinion tooth contact patterns  
 Disassemble, inspect, measure and adjust or replace differential components  
 Reassemble and reinstall differential case assembly; measure run-out  
 Diagnose, noise, slippage, and chatter concerns in a limited slip differential  
 Inspect and flush differential housing; refill with correct lubricant  
 Inspect and reinstall limited slip clutch components  
 Measure limit slip differential rotating torque  
 Diagnose drive axle shafts, bearings and seals for noise, vibration and leakage  
 Inspect and replace drive axle shaft wheel studs  
 Remove and replace drive axle shafts  
 Inspect drive axle shaft seals, bearings, and retainers  
 Measure drive axle flange run-out and shaft endplay  
 Diagnose 4WD noise, vibration, and unusual steering concerns  
 Inspect, adjust and repair 4WD shifting controls and components  
 Remove and reinstall transfer case  
 Disassemble, service, and reassemble transfer case and components  
 Inspect 4WD front wheel bearings and locking hubs  
 Check 4WD drive assembly seals and vents  
 Diagnose, test, adjust and replace 4WD electrical components

**V. Learner Outcomes:**

Evaluated by multiple choice, fill in blank or true/false tests:

1. calculate torque multiplication and speed reduction
2. identify the parts of and diagnosis problems with differentials
3. identify the adjustments necessary for a hypoid gear set
4. diagnose problems with clutches, throwout bearings and pilot bearings
5. identify the parts of and diagnose problems with manual transmissions and driveshafts
6. identify the parts of and diagnose problems with manual transaxle and drive axles

**VI. Evaluated by active participation in team projects:**

1. participate in transmission and final drive removal, disassembly, and repair
2. participate in the diagnosis of part wear and failure
3. participate in the adjustment of a hypoid gear set
4. participate in the removal and replacement of a U-joint
5. participate in the removal and replacement of a CV-joint
6. participate in the diagnosis and replacement of a clutch assembly
7. 75% of students will be able to complete these assignments

**VI. The following General Education Objectives will be addressed in this course:**

  **X**   **Communications**

  **X**   **Learning Skills**

  **X**   **Critical Thinking**

       **Interpersonal Skills and Human Relations**

  **X**   **Computational and Computer Skills**

       **Understanding Culture and Society**

  **X**   **Understanding Science and Technology**

       **Wellness**