

# Dakota County Technical College

## **AUTM 2032: Manual Trans-Transaxle, Clutches, Transfer Cases and Differentials**

### **A. COURSE DESCRIPTION**

Credits: 3

Lecture Hours/Week: 1

Lab Hours/Week: 2

OJT Hours/Week: \*.\*

Prerequisites: None

Corequisites: None

MnTC Goals: None

This course will cover the operation and proper repair procedures of current differentials, manual transmissions, transaxles, and transfer cases used on late model vehicles. It also covers the operation and proper repair procedures for locking hubs in four-wheel drive vehicles.

**B. COURSE EFFECTIVE DATES:** 12/11/2009 - Present

**C. OUTLINE OF MAJOR CONTENT AREAS**

**D. LEARNING OUTCOMES (General)**

1. Bleed hydraulic clutch system
2. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
3. Diagnose clutch noise, binding, slippage, pulsation, and chatter: determine necessary action
4. Diagnose fluid loss, level, and condition concerns; determine necessary action
5. Diagnose noise, hard shifting, jumping out of gear, and fluid leakage concerns: determine necessary action
6. Disassemble, clean, and reassemble transmission/transaxle components
7. Drain and fill manual transmission/transaxle and final drive unit
8. Identify and interpret drive train concern: determine necessary action
9. Inspect and reinstall power train mounts
10. Inspect and replace clutch pressure plate assembly and clutch disc
11. Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces
12. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs: perform necessary action
13. Inspect engine block, clutch (bell) housing, and transmission/transaxle case mating surfaces: determine necessary action
14. Inspect flywheel and ring gear for wear and cracks: determine necessary action
15. Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents: perform necessary action
16. Inspect, adjust and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs
17. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers
18. Inspect, remove or replace crankshaft pilot bearing or bushing (as applicable)
19. Locate and interpret vehicle and major component identification numbers (VIN), vehicle certification labels, calibration decals)
20. Measure flywheel runout and crankshaft endplay: determine necessary action
21. Remove and reinstall transmission/transaxle
22. Remove and replace transaxle final drive
23. Research applicable vehicle and service information, such as drive train system operation, fluid type, vehicle service history, service precautions, and technical service bulletins
24. Check drive assembly seals and vents; check lubricant level
25. Check ring and pinion tooth contact patterns: perform necessary action
26. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles
27. Clean and inspect and flush differential housing; refill with correct lubricant
28. Diagnose constant-velocity (CV) joint noise and vibration concerns: determine necessary action
29. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns: determine necessary action
30. Diagnose noise, slippage, and chatter concerns: determine necessary action
31. Diagnose noise, vibration, and unusual steering concerns: determine necessary action
32. Diagnose test, adjust, and replace electrical/electronic components of four-wheel drive systems
33. Diagnose transaxle final drive assembly noise and vibration concerns: determine necessary action
34. Diagnose universal joint noise and vibration concerns: perform necessary action
35. Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case
36. Disassemble, service, and reassemble transfer case and components
37. Inspect and reinstall clutch (cone or plate) components

38. Inspect and reinstall speedometer drive gear, driven gear, vehicle speed sensor (VSS), and retainers
39. Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings
40. Inspect and replace drive axle shaft seals, bearings, and retainers
41. Inspect and replace drive axle shaft wheel studs
42. Inspect front-wheel bearings and locking hubs: perform necessary action
43. Inspect lubrication devices (oil pump or slingers): perform necessary actions
44. Inspect ring gear and measure runout: determine necessary action
45. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets
46. Inspect, service, and replace shaft center support bearings
47. Inspect, service, and replace shafts, yokes, boots, and CV joints
48. Inspect, test, and replace transmission/transaxle sensors and switches
49. Measure and adjust drive pinion bearing preload
50. Measure and adjust drive pinion depth
51. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types)
52. Measure drive axle flange runout and shaft endplay: determine necessary action
53. Measure endplay or preload (shim or spacer selection procedure) on transmission/transaxle shafts: perform necessary action
54. Measure rotating torque: determine necessary action
55. Reassemble and reinstall differential case assembly; measure runout: determine necessary action
56. Remove and reinstall transfer case
57. Remove and replace drive axle shafts
58. Remove and replace front wheel drive (FWD) front wheel bearing
59. Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings
60. Remove, inspect, measure, adjust, and reinstall transaxle final drive, pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly

**E. Minnesota Transfer Curriculum Goal Area(s) and Competencies**

None

**F. LEARNER OUTCOMES ASSESSMENT**

As noted on course syllabus

**G. SPECIAL INFORMATION**

None noted