

CUYAMACA COLLEGE
OFFICIAL COURSE OUTLINE

AUTOMOTIVE TECHNOLOGY 192 – ASSET–DRIVE TRAIN

5.5 hours lecture, 7.5 hours laboratory, 8 units

Catalog Description

Ford ASSET course encompassing the study of modern drive train systems. Includes theory of operation, diagnosis, repair and overhaul of manual transmissions, clutches, drivelines and differentials including four wheel drive and front wheel drive. The course also includes the theory of operation, diagnosis, repair and overhaul of automatic transmissions and transaxles. Current computerized control system operation and diagnosis of the drive train will be emphasized. Includes Ford Motor Company certification and preparation for ASE Certification. Complemented by work experience in the dealership.

Prerequisite

None

Course Objectives

Students will be able to:

- 1) Manual Drive Train and Axles:
 - a. Inspect, measure and diagnose manual clutches.
 - b. Inspect, measure and diagnose manual clutch hydraulic actuation systems.
 - c. Remove and reinstall manual transmissions/transaxles.
 - d. Clean, disassemble, measure and diagnose manual transmissions/transaxles.
 - e. Inspect and replace gaskets, seals and sealing surfaces of manual transmissions/transaxles.
 - f. Measure and adjust endplay and preload of gears, shafts and bearings.
 - g. Inspect, measure; replace synchronizer hub, sleeve, keys, springs and inserts.
 - h. Diagnose transmission noise and vibrations.
 - i. Diagnose constant velocity joint noises.
 - j. Inspect, service and replace constant velocity joints, shafts and boots.
 - k. Inspect, service and replace driveshaft universal joints.
 - l. Diagnose ring and pinion vibration, noise and leakage concerns.
 - m. Measure ring and pinion and companion flange run out.
 - n. Remove, inspect and replace drive pinions, ring gears, spacers and bearings.
 - o. Measure and adjust pinion depth and preload.
 - p. Measure and adjust ring gear preload and backlash.
 - q. Display and interpret ring and pinion gear tooth contact patterns.
 - r. Disassemble, inspect, measure and adjust open and traction-loc differentials.
 - s. Inspect, adjust and repair 4-wheel drive shifting controls.
 - t. Disassemble, diagnose, reassemble transfer case.
 - u. Disassemble, diagnose and repair locking hubs and wheel bearings.
 - v. Perform computer diagnostics on electronic all wheel drive systems.
 - w. Diagnose, test and replace electrical/electronic components of all wheel drive systems.
- 2) Automatic Transmissions and Transaxles:
 - a. Identify and interpret transmission concern, determine necessary action.
 - b. Interpret transmission smell and color, determine action necessary.
 - c. Perform and interpret pressure tests.
 - d. Perform lock-up converter tests, determine appropriate action.
 - e. Perform on-board computer diagnostics tests, interpret results and perform repairs.
 - f. Adjust throttle valve cable and gear selector manual levers.
 - g. Inspect, adjust and replace vacuum modulator.
 - h. Inspect and replace bushings, gaskets and seals.
 - i. Flush and filter transmission fluid.
 - j. Remove, inspect and replace torque converter.
 - k. Disassemble, clean and inspect transmission.
 - l. Inspect, measure, clean and replace valve body.
 - m. Inspect servo and accumulator bores, pistons, seals, spring and determine proper repair.
 - n. Assemble transmission.
 - o. Inspect and measure torque converter endplay.
 - p. Inspect and measure oil pump assembly.
 - q. Measure endplay and preload of transmission, determine necessary action.
 - r. Inspect and measure thrust washers and bearings.
 - s. Inspect seal rings, ring grooves and sealing surfaces.
 - t. Inspect and measure planetary gear assembly, replace as needed.
 - u. Inspect transaxle drive, link chains, sprockets, gears, bearings and bushings, perform necessary repairs.
 - v. Inspect and reinstall parking pawl, shaft, spring and retainer.

- w. Inspect clutch drum, piston, check-balls, springs, retainers, friction plates and pressure plates, replace as necessary.
- x. Measure clutch pack clearance, adjust as necessary.
- y. Perform air pressure checks of clutches and servo assemblies.
- z. Inspect roller and sprag clutches, replace as necessary.
- aa. Inspect bands and drums adjust or replace as necessary.

Special Materials Required of Student

- 1) Mechanic's hand tool set
- 2) Approved safety glasses

Minimum Instructional Facilities

- 1) Auto tech lab (6 bays)
- 2) Complete selection of special tools for Ford Motor Co. transmissions
- 3) Various training models
- 4) Automotive videos
- 5) Training vehicles
- 6) Front and rear axle assemblies
- 7) Four wheel drive transfer case assemblies
- 8) Manual transmissions and transaxles
- 9) Automatic transmissions and transaxles

Course Content

- 1) Lecture:
 - a. Purpose of clutch
 - b. Types of clutches
 - c. Pressure plate design
 - d. Driveshafts
 - e. Standard transmission principles
 - f. Gear types
 - g. Synchronizer types
 - h. Gear ratios
 - i. Overdrive
 - j. Driveline types
 - k. Rear drive axles
 - l. Front drive axles
 - m. Differentials
 - n. Four wheel drive transfer cases
 - o. Manual locking hubs
 - p. Automatic locking hubs
 - q. Electronic automatic all-wheel drive
 - r. Hydraulic theory
 - s. Coolers and fluid types
 - t. Torque converter operation including lock-up type
 - u. Planetary gears operation and control
 - v. Operation of drums, bands, servos, accumulators, clutches, modulators, governors
 - w. Mechanical shift control and valve bodies
 - x. Electronic shift control and solenoid bodies
 - y. Diagnosing mechanical and electronic transmission problems
- 2) Lab:
 - a. Introduction and safety
 - b. Universal joint repair
 - c. Final drive overhaul (standard and traction-loc types)
 - d. Transfer case overhaul
 - e. Wheel bearing replacement
 - f. Locking hub overhaul
 - g. Automatic all wheel drive system computerized control diagnosis and testing
 - h. Manual transmission and transaxle disassembly
 - i. Manual transmission and transaxle power flow
 - j. Manual transmission and transaxle gauging
 - k. Manual transmission and transaxle reassembly
 - l. Automatic transmission and transaxle disassembly
 - m. Automatic transmission and transaxle gauging
 - n. Valve body service
 - o. Automatic transmission and transaxle assembly and testing
 - p. Automatic transmission and transaxle computerized control diagnosis and testing

Method of Instruction

- 1) Lecture and demonstration
- 2) Group work

- 3) Internet multimedia coursework as required by Ford Motor Company
- 4) PowerPoint presentations
- 5) Intensive hands-on training utilizing late model drive train components and tools
- 6) Various late model vehicles for repair practice

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Quizzes and exams that measure the student's ability to demonstrate mastery of drive train concepts and situational diagnostic scenarios requiring critical thinking skills for proper completion.
- 2) Student workbook with shop assignments and homework that require students to perform tasks that demand a mastery of the learning outcomes.
- 3) Instructor's verification of student completed component inspection and repair operations.
- 4) Individual hands-on performance exam requiring students to analyze, test, apply proper repair sequence and verification of repair.
- 5) Verification of student completion of multimedia courses offered on the internet measuring the student's ability to explain drive train operation, model repair operations and access service information.

Texts and References

- 1) Required: Various Ford Motor Company training publications.
- 2) Supplemental: Online training courses and service publications supplied by Ford Motor Company.

Exit Skills

Students having successfully completed this course exit with the following skills, competencies and/or knowledge:

- 1) Clutch diagnosis and repair.
- 2) Manual transmission/transaxle diagnosis and repair.
- 3) Drive shaft and axle shaft diagnosis and repair.
- 4) Drive axle diagnosis and repair.
- 5) Four wheel drive/all wheel drive diagnosis and repair.
- 6) Automatic transmission/transaxle diagnosis and repair.
- 7) Automatic transmission/transaxle maintenance and adjustment.