

SYLLABUS
AUTOMATIC TRANSMISSIONS/TRANSAXLES
AND MANUAL TRANSAXLES
AUTO-1270

2011

WESTERN NEBRASKA COMMUNITY COLLEGE
DIVISION OF APPLIED TECHNOLOGIES

I. CATALOG DESCRIPTION:

AUTO-1270

Automatic Transmissions/Transaxles and Manual Transaxles

Prerequisite: None

This is a course with emphasis on power trains, including the theory and shop practice of automotive, commercial, and agriculture vehicles. Automatic transmission units and transaxle assemblies used in automobile, commercial and agricultural vehicles are explained. Students may supply shop work, but it is not mandatory.

Offered spring semester only.

(6/60/90/0/0/10)

II. COURSE OBJECTIVES/COMPETENCIES:

The student will be able to:

- A. Develop clean work habits, attitudes and skills related to automatic transmissions and manual transaxle servicing. [GE Goal: 5]
- B. Assess information concerning the vocational opportunities offered by the area of automatic transmissions and manual transaxle servicing. [GE Goal: 5]
- C. Work effectively with others. [GE Goal: 5]
- D. Perform repairs under conditions similar to those in the automotive service industry.
- E. Demonstrate knowledge of correct nomenclature of tools, lab techniques and equipment usage, resulting in an intelligent and effective application of skills related to automatic transmission and manual transaxle servicing. [GE Goal: 2]
- F. Analyze, diagnose and determine necessary repairs required to repair modern automatic transmissions and manual transaxles. [GE Goal: 2]
- G. Develop the technical and academic knowledge necessary to expand on lifelong learning as the automotive industry continually updates. [GE Goal: 5]
- H. Research shop manuals and Internet sites for correct repair procedures and write a descriptive work order upon completion of repairs. [GE Goals: 1 & 3]

III. INSTRUCTIONAL MATERIALS:

- A. Textbook

AUTOMATIC TRANSMISSIONS/TRANSAXLES AND MANUAL TRANSAXLES
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1. James D. Halderman *AUTOMOTIVE TECHNOLOGY Principles, Diagnosis, and Service. Current Edition.*

B. Required References

1. Motors Repair Manual
2. Chilton Repair Manual
3. Mitchell Repair Manual
4. Manufacturers Shop Manuals

C. Visual Aides:

1. Films
2. VCR/ DVD media
3. Demonstration by instructor
4. Field trips to industry
5. Charts

IV. COURSE OUTLINE:

A. Approximate Breakdown

1. Tools
2. Special purpose tools
3. Measuring tools
4. Fastening devices and tube fittings
5. Automatic transmissions
6. Automatic transaxles
7. Manual transaxles

V. SPECIFIC COURSE REQUIREMENTS:

A. Specific Instruction

1. Shop safety
 - a) Safe behavior in the shop

- b) Power equipment in operation
- c) Shop tour

2. Tools—Correct use and Proper Names

- a) Screwdrivers
- b) Wrenches
- c) Hammers
- d) Chisels and punches
- e) Files
- f) Drills
- g) Drill bits
- h) Metal saws and blades
- i) Pliers
- j) Cleaning tools
- k) Sockets and handles

B. Special Purpose tools

1. Automatic transmission tools

- a) Busing drivers (removing and installing)
- b) Dial indicator
- c) Clutch pack adjusting tools
- d) Band adjusting tools
- e) Oil pump alignment tools
- f) Clutch spring/retainer compressor
- g) Oil pump puller
- h) Governor repair reamer and sleeve installer tool
- i) Clutch seal installation tools

j) Teflon seal installing and re-sizing tool

2. Measuring tools

- a) Micrometers
- b) Feeler gauges
- c) Torque wrenches
- d) Caliper

3. Fastening devices

- a) Cap screws and nuts
- b) Rivets
- c) Washers
- d) Cotter pins
- e) Snap rings

C. Automatic transmissions and transaxles

1. Automatic transmission types

- a) 2 speed
- b) 3 speed
- c) 4 speed
- d) With overdrive

2. Torque converters

- a) Fluid couplers
- b) Three element torque converter
- c) Mechanical lock up torque converters
- d) Electronic lock up torque converters

3. Newton's Law

4. Oil pumps

- a) Variable flow
 - b) Rotor
 - c) Vane
 - d) Gear
5. Basic hydraulics
- a) Pascal's Law
 - b) Hydraulic servos
 - c) Accumulators
 - d) Hydraulic clutch
6. Planetary gears
- a) Simple/Simpson planetary
 - b) RavenauX planetary
 - c) Compound planetary
7. Brake Bands
- a) Flexible band
 - b) Rigid band
 - c) Double wrap (split band)
8. Clutches
- a) Multiple disc clutches
 - b) Driving clutches
 - c) Holding clutches
 - d) One-way roller clutch
 - e) One-way sprag clutch
9. Valves
- a) Flow directing

- b) Pressure regulating (balanced valve)
- c) Manual
- d) One-way (check valve)
- e) Boost valve
- f) Throttle valve
- g) Modulator valve
- h) Governor valve
- i) Shift valves
- j) Valve body

10. Oil circuits

- a) Main line
- b) Governor
- c) Throttle/modulator
- d) Lubrication/cooling

11. Governor

12. Oil cooling

13. Lubrication

14. Transmission fluids

15. Manual transaxles

- a) Torque multiplication
- b) Shift mechanisms
- c) 3 speed
- d) 4 speed
- e) 5 speed
- f) 6 speed

g) With overdrive

VI. Competency Task List

A. General Transmission and Transaxle Diagnosis

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
2. Identify and interpret transmission/transaxle concern; differentiate between engine performance and transmission/transaxle concerns; determine necessary action.
3. Research applicable vehicle and service information, such as transmission/transaxle system operation, vehicle service history, service precautions, and technical service bulletins.
4. Locate and interpret vehicle and major component identification numbers.
5. Diagnose fluid loss, and condition concerns; check fluid level in transmissions with and without dip- stick; determine necessary action.
6. Perform pressure tests (including transmissions/ transaxles equipped with electronic pressure control); determine necessary action.
7. Perform stall test; determine necessary action.
8. Perform lock-up converter system tests; determine necessary action.
9. Diagnose noise and vibration concerns; determine necessary action.
10. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.
11. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).

B. In-Vehicle Transmission/Transaxle Maintenance and Adjustment Repair

1. Inspect, adjust, and replace manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
2. Inspect and replace external seals, gaskets, and bushings.

3. Diagnose electronic transmission control system using a scan tool; determine necessary action.
4. Service transmission; perform visual inspection; replace fluid and filters.

C. Off-Vehicle Transmission and Transaxle Repair

1. Remove and reinstall transmission/transaxle and torque converter, inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.
2. Disassemble, clean, and inspect transmission/transaxle.
3. Inspect, measure, clean, and replace valve body (includes surfaces and bores, springs, valves, sleeves, retainers, brackets, check-balls, screens, spacers, and gaskets).
4. Inspect servo and accumulator bores, pistons, seals, pins, springs, and retainers; determine necessary action.
5. Assemble transmission/transaxle.
6. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.
7. Install and seat torque converter to engage drive/splines.
8. Inspect, measure, and reseal oil pump assembly and components
9. Measure transmission/transaxle end play or preload; determine necessary action.
10. Inspect, measure, and replace thrust washers and bearings.
11. Inspect oil delivery circuits, including seal rings, ring grooves, and sealing surface areas, feed pipes, orifices, and check valve/balls.
12. Inspect bushings; determine necessary action.
13. Inspect and measure planetary gear assembly components; determine necessary action.
14. Inspect case bores, passages, bushings, vents, and mating surface; determine necessary action.
15. Inspect clutch drum, piston, check-balls, springs, retainers, seals, and

friction and pressure plates; determine necessary action.

16. Measure clutch pack clearance; determine necessary action.

17. Air test operation of clutch and servo assemblies.

18. Inspect roller and sprag clutch, races, rollers, sprags, springs, cages and retainers; determine necessary action.

19. Inspect bands and drums; determine necessary action.

D. Manual Transaxle, Diagnosis and Repair

1. Diagnose, hard shifting, jumping out of gear, concerns; determine necessary action.

2. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers

3. Inspect and replace gaskets, seals and sealants; inspect sealing surfaces.

4. Remove and replace transaxle final drive.

5. Inspect, adjust and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanisms, interlocks, and spring.

6. Measure end play or preload (shim/spacer selection procedure) on transmission/ transaxle shafts; perform necessary action.

7. Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, blocking rings.

8. Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers and case assembly.

9. Inspect lubrication devices (oil pump or slingers); perform necessary action.

10. Inspect lubrication devices (oil pump or slingers).

VII. METHOD OF PRESENTATION:

A. Method of instruction includes individual and group demonstrations. Work in the classroom and in the shop is closely correlated.

- B. The student is first told and shown why and how a mechanism works. He/she then goes to the lab and verifies what was seen and heard in the lecture. All repair, overhaul and service work is likewise preceded by classroom lecture and demonstration. There is little time lapse between classroom presentation and related lab work; the student applies the theory before it has had a chance to grow stale in the mind.

VIII. METHOD OF EVALUATION:

- A. Regular attendance is a must because performance in the lab under actual working conditions is stressed.
- B. Quality of work
- C. Quantity of work
- D. Effort and attitude to include:
 - 1. Cooperation with group and instructor
 - 2. Care and use of equipment
 - 3. Organization and pride in work.
 - 4. General courtesy and respect for rule and general situation in the shop.
 - 5. Observation of safety factors
 - 6. Respect for other students and their work.
 - 7. Thriftiness in use of materials and equipment
- E. Tests are given at frequent intervals. Two types of tests are given - practical in lab and written in classroom.
- F. Final grade will be determined by the following criteria:
 - 1. Quality and quantity of work
 - 2. Effort and attitude
 - 3. Testing - practical and written

IX. ACADEMIC INTEGRITY:

Academic integrity forms a fundamental bond of trust between colleagues, peers, teachers, and students, and it underlies all genuine learning. At WNCC, there is no tolerance for plagiarism or academic dishonesty in any form, including unacknowledged "borrowing" of proprietary material, copying answers or papers,

or passing off someone else's work as one's own. Such acts are reported to the appropriate authorities.

A breach of ethics or act of dishonesty can result in:

- failure of a paper or exam within a course
- failure of an entire course (blatant plagiarism, cheating on a test or quiz)
- academic suspension or expulsion from the college

X. EQUAL ACCESS STATEMENT:

Western Nebraska Community College is committed to providing equal access to educational opportunities. If you believe that you qualify under the Americans with Disabilities Act (ADA), please contact the Director of Counseling (308-635-6090) as soon as possible to begin a process of documentation review and determination for appropriate accommodation or adaptive strategies.

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