COURSE OUTLINE

AUTO 221 - AUTOMATIC TRANSMISSIONS

Prepared By: Issac R. Thomas

Revised By: BRANDON BALDWIN
A. **TITLE:** Automatic Transmission
B. **COURSE NUMBER:** AUTO 221
C. **CREDIT HOURS:** 4
D. **WRITING INTENSIVE COURSE:** NO
E. **COURSE LENGTH:** 15 weeks
F. **SEMESTER(S) OFFERED:** Spring
G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:** 3 hours of lectures per week, 3 hours of laboratory per week
H. **CATALOGUE DESCRIPTION:** Students study fundamental principles of automatic transmissions. Topics include torque converters, planetary gearsets and hydraulics. Various powerflows are compared using specific transmissions as examples.
I. **PRE-REQUISITES/CO-REQUISITES:**
   a. Pre-requisite(s): AUTO 141, AUTO 144, AUTO 113, AUTO 114
   b. Co-requisite(s): NONE
J. **GOALS (STUDENT LEARNING OUTCOMES):**

<table>
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<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<td>Demonstrate knowledge of basic theories of torque converters and torque converter clutch systems.</td>
<td>2. Crit. Thinking 3. Prof. Comp.</td>
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<td>Apply basic hydraulic theories involved in the transmission power flow.</td>
<td>2. Crit. Thinking 3. Prof. Comp.</td>
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<td>Demonstrate knowledge of the mechanical power flow in modern transmissions.</td>
<td>2. Crit. Thinking 3. Prof. Comp.</td>
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<td>Apply knowledge to troubleshoot and test the automatic transmission both on the car and on the transmission dynamometer.</td>
<td>2. Crit. Thinking 3. Prof. Comp.</td>
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<td>Perform an actual automatic transmission overhaul.</td>
<td>2. Crit. Thinking 3. Prof. Comp.</td>
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K. **TEXTS:** Automatic Transmissions and Transaxles, Birch - Rockwood
L. **REFERENCES:** Shop manuals of manufacturers, Mitchell manuals, All Data, General Motors EST
M. **EQUIPMENT:** Standard automotive required equipment
N. **GRADING METHOD:** A-F
O. **MEASUREMENT CRITERIA/METHODS:** Quizzes, Exams, Homework, Laboratory performance tests, attendance
P. **DETAILED TOPICAL OUTLINE:**

1. **Gear Sets**
   a. Power flows from a simple planetary gear set
   b. Compound/Simpson planetary gear sets
   c. Ravigneaux gearsets

2. **Hydraulic Systems**
   a. Construction and Operation of Oil Pumps
   b. Valve Body
      1. Relief Valve
      2. Check Valve
      3. Balance Valve
      4. Manual Valve
      5. Throttle Valve
   c. Operation of Clutches and Servos
   d. Operation of Modulators and Accumulators
   e. Governor Pressure vs. Throttle Pressure
   f. Function of Valve Body in Upshift and Downshift

3. **Fluid Coupling**
   a. Theory of Operation
   b. Efficiency
   c. Applications

4. **Torque Converters**
   a. Theory of Operation
   b. Three Member Torque Converter
   c. Function of Stator
   d. Theory of Overrunning Clutch
   e. Torque-Converter Clutches

5. **Transmission Construction and Power Flow**
   b. Construction and Power Flow of following transmissions:
      1. Chrysler Corporation Torqueflite series
      2. Ford C-series
      3. GM 3-speed
      4. GM 4-speed
      5. Ford 4-speed
      6. Chrysler 4-speed

6. **Electronic Controls**
   a. PCM, VCM, TCM
   b. Inputs
   c. Outputs
   d. Valve bodies
   e. Diagnostics
7. Troubleshooting
   a. Proper use of air pressure test
   b. Proper use of troubleshooting chart
   c. On-car test of automatic transmission
   d. Dynamometer Testing of an Automatic Transmission

Q. LABORATORY OUTLINE as per 2013 NATEF Standards:

A. General: Transmission and Transaxle Diagnosis
   1. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action.
   2. Research applicable vehicle and service information fluid type, vehicle service history, service precautions, and technical service bulletins.
   3. Diagnose fluid loss and condition concerns; determine necessary action.
   4. Check fluid level in a transmission or a transaxle equipped with a dip-stick.
   5. Check fluid level in a transmission or a transaxle not equipped with a dip-stick.
   6. Perform stall test; determine necessary action.
   7. Perform lock-up converter system tests; determine necessary action.
   8. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.
   9. Diagnose pressure concerns in a transmission using hydraulic principles

B. In-Vehicle Transmission/Transaxle Maintenance and Repair
   1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
   2. Inspect for leakage; replace external seals, gaskets, and bushings.
   3. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses.
   4. Drain and replace fluid and filter(s).
   5. Inspect, replace and align power train mounts.

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. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings.
   3. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.
   4. Describe the operational characteristics of a continuously variable transmission.
   5. Describe the operational characteristics of a hybrid vehicle drivetrain.