COURSE OUTLINE

Course Number	Course Title	Credits
AUT 225	Automatic Transmission Service	3
Hours: Lecture/Lab/Other	**Co- or Pre-requisite**	**Implementation Semester & Year**
2/3	AUT 224	Spring 2022

Catalog description:
Examines principles of operation, diagnosis, and repair of current automatic transmissions and transaxles, including electronic controls. Examines hydraulic theory with emphasis on using mechanical and electronic test equipment and special tools for diagnosis, repair, and in-car service. Requires students to disassemble, inspect, and assemble several automatic transmissions and transaxles.

General Education Category:
Not GenEd

Course coordinator:
Jason Evans, 609-570-3776, evansj@mccc.edu

Required texts & Other materials: Halderman, James D., Automatic Transmissions and Transaxles, Edition 7. Pearson Education Publishing, 2018
ISBN-13: 9780134616797

Access to a personal laptop computer, tablet, or Chromebook is strongly recommended during class and lab.

Students must purchase safety glasses, work boots, and appropriate clothing to work in the automotive lab. This requirement is reviewed with the students on the first day of class. These items are not needed for the first class meeting of the term.

The following is provided at no charge to the students:
Vehicle service information provided though Stellantis, Subaru of America, Audi of America, or ALLDATA.

Accreditation Statement:
The Automotive Technology, Mopar CAP, Program is Master Automotive Service Technology (MAST) accredited by Automotive Service Excellence Education Foundation.
https://www.aseeducationfoundation.org/

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Analyze vehicle service information to locate proper procedures for diagnosing, repairing, and servicing automatic transmissions and transaxles. [Supports ILG # 4, 10 ; PLO # 1, 3]
2. Explain the purpose and operation of a torque converter. [Supports ILG # 1, 10; PLO # 3, 4]
3. Explain the operation of an automatic transmission or transaxle. [Supports ILG # 1, 10; PLO # 3, 4]
4. Use a series of mechanical and electrical diagnostic tests to pinpoint the root cause of a transmission or transaxle performance concern. [Supports ILG # 3, 4, 10, 11; PLO # 1, 3]
5. Describe common repairs and maintenance services possible without removing the transmission or transaxle from the vehicle. [Supports ILG # 1, 4; PLO # 1, 4]
6. Explain the extra precautions necessary following a catastrophic mechanical transmission or transaxle failure. [Supports ILG # 1, 10, 11; PLO # 1, 3, 4]
7. Demonstrate the disassembly, inspect, and assembly process for an automatic transmission by following the proper procedures outlined in the manufacturer's published service information. [Supports ILG # 4, 10, 11; PLO # 1, 2, 3]
8. Demonstrate the disassembly, inspect, and assembly process for an automatic transaxle by following the proper procedures outlined in the manufacturer's published service information. [Supports ILG # 4, 10, 11 ; PLO # 1, 2, 3]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.
Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Automotive Technology (PLO)

1. Diagnose, service, and repair current automotive technologies.
2. Demonstrate desirable attitudes and work habits while working individually or with others.
3. Obtain service repair information and procedures from online websites and electronic databases.
4. Communicate effectively and professionally with customers and fellow technicians.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **Transmission and Transaxle Identification [Supports Course SLO # 1, 3, 6]**

Learning Objectives

The student will be able to:

- Identify the model numbers and applications of multiple transmissions and transaxles by using the appropriate vehicle service information, build course, or transmission/transaxle identification numbers.
- Identify transmission/transaxle fluid types for multiple vehicles by referencing the appropriate vehicle service information and labeling found on the vehicle or transmission/transaxle.
- Analyze and adjust automatic transmission/transaxle fluid level in a vehicle equipped with a dipstick and a vehicle without a dipstick.
- Explain the general differences between transmission fluid types, including fluid types used in continuously variable transmissions (CVTs).

Unit II **Fluid Leak Diagnosis and Repair [Supports Course SLOs # 1, 5]**

Learning Objectives

The student will be able to:

- Identify when fluid is leaking from automatic transmissions/transaxles.
- Identify the source of automatic transmission/transaxle fluid leaks.
- Demonstrate proper procedures to repair the source of automatic transmission/transaxle fluid leaks.

Unit III **Fundamentals of Fluid Couplings and Torque Converters [Supports Course SLO # 1, 2, 4]**

Learning Objectives

The student will be able to:

- Explain the purpose of a torque converter under.
- Identify each internal component in a late model torque converter.
- Explain the purpose and the operation of each internal component in a late model torque converter, under various vehicle-operating conditions, such as at idle, under acceleration, during cruise speeds, and during deceleration.
- Demonstrate proper mechanical and electronic testing of a torque converter to analyze for faults in torque converter operation.
- Describe common faults with stator one-way clutches, torque converter clutches, torque converter leaks, and unit balance.

Unit IV **Oil Pump Assembly [Supports Course SLO # 1, 4, 5]**

Learning Objectives

The student will be able to:

- Describe the purpose and operation of an automatic transmission/transxle oil pump assembly.
- Compare the differences between crescent gear, gerotor, dual stage, and vane style oil pumps.
- Appraise oil pump assembly condition, internally and externally, using various measurement tools.
- Interpret automatic transmission/transaxle malfunctions as they relate to a failed oil pump assembly.

Unit V **Planetary Gear Train [Supports Course SLO # 3, 4]**

Learning Objectives

The student will be able to:

- Identify the components used in a conventional planetary gear train.
- Explain the operation of a planetary gear train assembly, identifying which components are being held, driven, or act as the output to provide gear reduction, direct drive, overdrive, and reverse in driveline systems.
- Explain the application and use of planetary gear trains in automatic transmission/transaxles, and four-wheel drive systems.
- Describe the inspection process for the individual components used in a conventional planetary gear train.

Unit VI **Frictional Units and Holding Devices [SLO # 1, 2, 3, 7, 8]**

Learning Objectives

The student will be able to:

- Explain the operation of a band and servo found in an automatic transmission/transaxle.
- Explain the operation of an over-running clutch assembly.
- Explain the operation of a clutch pack assembly.
- Demonstrate the process necessary to disassemble, inspect, and assemble each transmission clutch assembly in an automatic transmission/transaxle, to analyze the condition of each internal component.
- Use precision measuring tools to check for clutch wear and to validate proper assembly of a clutch.

Unit VII **The Flow of Power [SLO # 1, 3, 4]**

Learning Objectives

The student will be able to:

- Identify which internal transmission components are applied or released during engagement of each transmission gear range, given an automatic transmission/transaxle power flow chart,.
- Hypothesize the cause of an automatic transmission/transaxle shifting concern before removing the transmission from the vehicle or completing unit disassembly, using a power flow chart.
- Explain engine braking and why certain clutch engagements provide engine braking while others do not.

Unit VIII **Hydraulic Systems [SLO # 1, 2, 3, 4, 6]**

Learning Objectives

The student will be able to:

- Demonstrate proper procedures to perform a series of automatic transmission/transaxle hydraulic pressure test procedures to analyze the cause of poor shift quality.
- Explain why flushing or replacing a transmission cooler assembly may be necessary following a catastrophic automatic transmission/transaxle failure.
- Explain the purpose and operation of an automatic transmission/transaxle valve body.
- Demonstrate proper procedures necessary to disassemble an automatic transmission/transaxle valve body and analyze components for damage and wear.
- Explain common hydraulic faults in an automatic transmission/transaxle and how they can cause poor transmission performance.
- Explain the importance of using the correct fluid type for each transmission/transaxle application.

Unit IX **Electrical Controls and Diagnosis [SLO # 1, 2, 3, 4, 5]**

Learning Objectives

The student will be able to:

- Explain various sensor types found in a vehicle, that provide inputs necessary for a vehicle's electronic control unit (ECU) to properly operate an automatic transmission/transaxle.
- Describe various ECU outputs devices that allow the ECU to operate an automatic transmission/transaxle through all operating conditions.
- Describe how vehicle communications concerns can impede the ECU's control of an automatic transmission/transaxle.
- Describe common electrical testing tools and procedures used in determining the root cause of a transmission performance concern.

Evaluation of student learning:

Students are evaluated using weekly quizzes, a mid-term exam, a final exam, graded homework assignments, and hands-on work assignments in the automotive laboratory. Students are expected to read the assigned textbook chapters, handouts, and complete vehicle manufacturers' training material (if applicable) outside of class and at appropriate times throughout the course.

Please note that:

- Any student who scores below a 60% (D) on the final exam must repeat the course
- Students enrolled in the any automotive program option sponsored by a vehicle manufacturer (Mopar CAP, Subaru University, or Audi AEP) must complete all vehicle manufacturer web courses, post-tests, and proctored assessments assigned at the start of the semester. The assigned web courses, post-test, and proctored assessments are in addition to the standard course assignments shown below. Due dates for each assigned web course, post-test, and proctored assessment is discussed in class, but all of them must be finished and passed before the beginning of the last week of the term.

Below is a list of the tools used for assessing student learning outcomes in this course. The percentages shown after each assessment tool refers to the weight each assessment has on a student's final course grade.

Exams 35%
Quizzes 20%
Hands-On Lab Assignments 33%
Homework 12%

Policy Statement for Missed Lab Demonstrations:

Due to the concerns for student and staff safety, a student who does not attend tool, equipment, and procedure demonstrations performed by the course instructor, prior to a hands-on learning activity, may be excluded from participating in the hands-on activity. This occurs because the tools, equipment, and chemicals necessary to complete automotive diagnosis and service often present safety hazards for users and observers if the correct handling procedures are not followed.

Reasons for not attending demonstrations may include full or partial absence during the demonstration, or if a student does not give his or her full attention during the demonstration. Enforcement of this classroom policy is at the discretion of the course instructor, and is based largely on the dangers involved with the use of the necessary tools, equipment, and chemicals required to complete the hands-on activity, and the time necessary to complete a make-up demonstration.