



AUME-760: AUTOMATIC TRANSMISSIONS & TRANSAXLES

Effective Term

Fall 2024

BOT Approval Date

12/14/2023

Discipline

AUME - Automotive/Transportation Tech

Course Number

760

Course Title

Automatic Transmissions & Transaxles

Short Title

Auto Transm Transaxles

Credit Status (CB 04)

D - Credit - Degree applicable

Units**Lecture Units**

3.00

Lab Units

1.00

Total Units

4.00

Hours**Lecture Contact Hours**

48-54

Out of Class Hours Lecture

96-108

Lab Contact Hours

48-54

Out of Class Hours Lab

0.00

Total Contact Hours

96 - 108

Total Out of Class Hours

96 - 108

Total Student Learning Hours

192 - 216

Is this an existing Extensive Lab?

No

**Do you want to propose this for Extensive Lab?**

Yes

Distance Education

No

Catalog Description

This course encompasses the diagnosis, service and repair of the automatic transmissions and transaxles used in modern automobiles and light trucks. Upon successful completion of the course, the student will be able to apply a systematic approach to the diagnosis and repair of common transmission and transaxle faults. The course content is intended to prepare the student to pass the ASE A2 Automatic Transmission and Transaxle certification exam.

Attach Supporting Documents

ASE PROGRAM STANDARDS_MAST.pdf

Attach Supporting Documents

ASE PROGRAM STANDARDS_AUTO_TRANS.pdf

Requisites**Recommended Preparation****Recommended Preparation (note that students can enroll in the class even if they haven't take the recommended course)**

AUME-700.

Codes**TOP Code (CB 03)**

0948.00* - *Automotive Technology

CIP Code

47.0604 - Automobile/Automotive Mechanics Technology/Technician.

Student Accountability Model (SAM) Priority Code (CB 09)

C - Clearly Occupational

Noncredit Category (CB 22)

Y - Credit Course

Repeatability Code

No

Grading Option

Letter grade OR P/NP

Minimum Qualifications

Minimum Qualifications	And/Or
Automotive Technology	End

CSU Area(s)

IGETC Area(s)

Learning Objectives

Learning Objectives

Learning Objective
1. Apply appropriate safety measures to be taken during the diagnosis and repair of automatic transmissions and transaxles.
2. Analyze the hydraulic circuits of an automatic transmission and evaluate their function based on manufacturer specifications.
3. Exhibit the ability to service, adjust, and/or overhaul an automatic transmission or transaxle according to generally accepted industry standards.
4. Assess the operation of the operation of an automatic transmission or transaxle and differentiate normal from abnormal function.
5. Formulate a systematic approach for diagnosing and repairing transmissions and transaxles and differentiate between hydraulic, mechanical and electrical faults.
6. Differentiate between serviceable and defective transmission components.
7. Compose a written repair order according to California State Bureau of Automotive Repair (BAR) standards.
8. Exhibit knowledge of the career opportunities this course makes available to everyone, including the members of traditionally underrepresented populations.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome
1. Students will exhibit the knowledge and skills necessary to ensure personal safety in the auto shop setting.
2. Students will be able to assess the operating condition of an automatic transmission or transaxle.
3. Students will possess the ability to remove and replace an automatic transmission or transaxle in a modern car or light truck.
4. Students will be able to rebuild an automatic transmission or transaxle so that the unit performs according to manufacturer specifications.

Program Learning Outcomes

Learning Outcome
Complete all NATEF (National Automotive Technician Education Foundation) task sheets.
Enter the workforce in the automotive industry.
Pass all eight areas in the ASE certification.

Institutional Learning Outcomes

Communication: The student will effectively express and exchange ideas through listening, speaking, reading, writing, visual works, and other modes of interpersonal expression.

Critical Thinking: The student will analyze problems, gather and synthesize relevant information, evaluate ideas, information, and evaluate alternative points of view to create, innovate and implement effective solutions.

Cultural Awareness and Humility: The student will demonstrate knowledge of and sensitivity toward individuals of diverse ethnicity, age, gender, sexual orientation, and religious affiliations, as well as toward those individuals with diverse abilities and socio-economic classes to respectfully interact with individuals of diverse perspectives, beliefs and values while being mindful of the limitation of their own cultural frameworks.

Information and Technology Literacy: The student will access, interpret, evaluate, and apply relevant information sources and digital media effectively, and in an ethical and legal manner.

Scientific Awareness: The student will apply the scientific method of inquiry to assess potential solutions for real-life challenges by employing science-based knowledge and methodologies in daily life.

Social Awareness: The student will recognize and analyze the interconnectedness of global, national, and local concerns, analyzing cultural, political, social, and environmental issues from multiple perspectives and appreciate similarities and differences among cultures.

Civic

Personal

and Professional Responsibility

Content

Course Lecture Content

1. Career Opportunities in the Automotive Repair Industry
 - a. Diversity in Hiring Practices
 - i. Existing Disparity in Male/Female Ratio
 - ii. Measures the Industry is Taking to Address Disparities
 - b. Options for Employment or Entrepreneurship
2. General Transmission/Transaxle Service
 - a. Documentation of Repairs
 - i. The Three "Cs"
 1. Customer Complaint
 2. Cause of the Complaint
 3. Correction of the Complaint
 - ii. Repair Order Preparation
 1. State Bureau of Automotive Repair Standards
 - a. Writing It Right
 - b. Use of Databases to Determine Part and Labor Costs
 - b. Use of Automotive Service Databases to Obtain Required Service Information
 - i. Alldata
 - ii. Mitchell ProDemand
 - iii. Automatic Transmission/Transaxle Components
 1. Component Identification
 2. Component Functions
 - iv. Hydraulic System Principles
 1. Pascal's Law
 2. Function of the Valve Body
 3. Fluid Types
 - a. Fluid Inspections
 - i. Level Inspection
 - ii. Condition Inspection
 - v. Planetary Gear Sets
 1. Gear Reduction
 2. Torque Multiplication
 - a. Power Flows in the Automatic Transaxle
 - vi. Electrical and Electronic Transaxle Controls
 1. Scan Tool Diagnostics
 2. Electrical/Electronic Principles
 - a. Voltage, Current and Resistance
 - b. Control Solenoid Theory of Operation
3. In-Vehicle Service Procedures
 - a. Differentiate Between In-Vehicle and Overhaul Services
 - b. In-Vehicle Service Summary
 - i. Fluid Service Procedures
 - ii. Electronic Relearn Procedures
 - iii. The Importance of the Transmission Mounts
 1. Safety Concerns
 2. Torque Steer Considerations
4. Transmission/Transaxle Overhaul Procedures
 - a. Operational Characteristics of Continuously Variable Transaxles
 - i. Planetary Gear Types
 1. Simpson Gear Sets
 2. Ravigneaux Gear Sets
 - ii. Drive Belt Types
 - iii. Drive Chain Types
 - b. Hybrid/Electric Vehicle Transaxle Types and Functions

- i. Electric Drive Motors
- ii. High-Voltage Safety Procedures
- iii. Use of Suitable Test Equipment
 - 1. Category 3 Test Meters
 - a. 1,000 Volt DC Requirements
 - b. Digital Multi-Meters
 - c. Isolation Testers
 - i. Armature Testing Machines
 - 2. Suitable Personal Protective Equipment (PPE)
- c. Inspection Procedures
 - i. Torque Converters
 - ii. Clutch Assemblies
- iii. Valve and Control Bodies
- iv. Fluid Pump Types and Inspection Procedures
- d. Overhaul Procedures
 - i. Criteria for Replacement of Bushings and Bearings
 - ii. Criteria for the Replacement of Clutch Assembly Components
 - iii. Discuss Checking the Operation of Clutch Assemblies with Compressed Air
 - iv. Discuss Diagnosis and Service of Electrical and Electronic Components
 - 1. Types and Function of Input Sensors
 - 2. Types and Functions of Control Solenoid Valves
 - v. Transmission Control Modules
 - 1. Module Diagnosis
 - 2. Module Replacement
 - 3. Module Reprogramming and Reflashing

Course Lab Content

- 1. Career Opportunities in the Automotive Repair Industry
 - a. Time Study
 - i. Relative Ease With Which Modern Diagnostics is Performed
 - ii. Time Disparity Study Between Male/Female Students
- 2. General Transmission/Transaxle Service
 - a. Electrical and electronic testing
 - i. Scan tool tests
 - ii. Multi-meter tests
 - b. Fluid testing
 - i. Type, level and condition inspection
 - ii. Fluid pressure testing
 - iii. Fluid leak and fluid loss testing
 - c. Torque converter testing
 - i. Lock-up clutch testing
 - ii. Stall-speed testing
- 3. In-Vehicle Service Procedures
 - a. Electrical/electronic component service
 - i. Input sensors
 - ii. Control solenoids
 - iii. Relearning and re-flashing control modules
 - iv. Electrical circuit repair
 - b. Mechanical component service (In-Vehicle)
 - i. Transaxle mount replacement
 - ii. External gasket, seal and bushing replacement
 - iii. Adjustment of components
- 4. Transmission/Transaxle Overhaul Procedures (Out-of-Car)
 - a. Removal and replacement
 - b. Disassembly and inspection of components
 - i. Torque converters
 - ii. Valve and control bodies

- iii. Clutches and bands
- iv. Bushings and bearings
- c. Precision measurement
 - i. Clutch components
 - ii. Valve body clearances
- iii. Bushings and thrust washers
- d. Reassembly
 - i. Bushing, bearing and thrust washer replacement
 - ii. Clutch component reassembly
 - 1. Seal and composite plate replacement
 - 2. Air test clutch operation
 - 3. Verify operation of over-run clutches
 - iii. Hydraulic pump overhaul
 - iv. Measure end-play and/or pre-load
 - v. Final assembly of external components
 - 1. Range sensors
 - 2. Speed and position sensors

Methods of Instruction

Method

Film/video Viewing and Discussion

Integration

Students will be exposed to accessible training videos, power-point presentations and demonstrations showing the function of actual transmission components and will discuss the theory of operation of the modern automatic transmission or transaxle.

Method

In-class Exercises

Integration

Students will analyze, research and discuss the various faults that occur in automatic transmissions and their support systems.

Method

Lab Activities

Integration

Students will perform different functions related to the diagnosis, removal, repair and replacement of the transmission or transaxle assembly.

Method

Lecture

Integration

The instructor will deliver lecture presentations on related subjects, such as planetary gear function and transmission power flow.

Method

Observation and Demonstration

Integration

The instructor will demonstrate the performance of various service, diagnosis and repair procedures related to automatic transmissions.



Method

Reading

Integration

The instructor will give reading assignments from the required textbook covering component identification, the theory of operation, diagnosis and repair of modern automatic transmissions.

Method

Directed Study

Integration

Students will be asked to research equity and inclusion issues surrounding the employment opportunities that are available to members of special populations who possess the ability to diagnose and repair automotive powertrain faults.

Methods of Evaluation**Method**

Capstone Project

Integration

The student will be required to prepare a two-page research paper and/or a classroom presentation which will explain the theory of operation of an automatic transmission or the computerized shift control system. Assessment of the student's performance will be based upon the relevance and accuracy of the information conveyed by the assigned paper as well as the organization and delivery of the classroom presentation.

Method

Class Participation

Integration

Students will be required to participate in lab activities in a small group setting. Assessment of student performance will be based upon their ability to remove, repair and replace an automatic transmission or transaxle in the amount of time prescribed in the manufacturer's published service information.

Method

Exams/Tests

Integration

The instructor will administer a final examination and may administer other examinations during the course of the semester. Questions will be presented in the style of an Automotive Service Excellence (ASE) certification exam and will be designed to assess the student's understanding of the theory of operation and proper procedures used to service and repair an automatic transmission or transaxle.

Method

Final Performance

Integration

Students will be asked to diagnose and/or repair a fault with an automatic transmission on a bugged vehicle. Students will be assessed on their ability to perform an accurate diagnosis and/or repair using procedures prescribed by the manufacturer's published service information and in the amount of time allotted by industry standard.



Method

Quizzes

Integration

Students will be required to complete the quizzes at the end of the assigned textbook chapters. The assessment of the student's understanding of the design, theory of operation and repair procedures used to solve automatic transmission complaints.

Method

Research Projects

Integration

Students will be asked to prepare a 2-3 page paper discussing how employment opportunities in the automotive aftermarket available to women and other members of special populations have become more prevalent in the past two decades. Evaluation will be made on the basis of the identification of the number and type of ways the profession has become more user friendly during the past 20 years, particularly for women who wish to enter the automotive aftermarket industry.

Assignments**Assignment Type**

Reading

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Read the chapters from the Automatic Transmissions and Transaxles textbook that your instructor assigns for the course. The reading assignments will help you to be a more active participant in the classroom work and more proficient at determining the cause of the special problems presented by electronically controlled automatic transmissions.

Assignment Type

Reading

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Research the employment opportunities available to members of special populations with special emphasis placed upon the increases in diversity, equity and inclusion that has occurred in the past two decades made possible by changes in manufacturing and repair technologies. You should be able to discuss the ways that the industry has changed in the past two decades and be able to identify at least two specific ways that it has become more attractive for women to participate in the automotive aftermarket industry.

Assignment Type

Other



In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Perform the diagnostic and/or repair tasks on an automatic transmission or transaxle prescribed by the Department's third-party accrediting body, the ASE Education Foundation (ASEEF).

Assignment Type

Other

In-class and/or outside of class

In-class

Formative or Summative

Summative

Assignment

Perform a diagnostic procedure for an automatic transmission or transaxle fault on a bugged vehicle and document your findings on a written repair order.

Assignment Type

Writing

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment

Prepare a work order that documents the verification, diagnosis, detailed summary of necessary repairs and recommendation for further suggested repairs or service. The work order must comply with the regulations prescribed by the State of California Bureau of Automotive Repair as listed in the "Write It Right" online preparation guide.

Course Materials**Textbooks**

Johanson, Chris and Duffy, James. (2022) Automatic Transmissions and Transaxles, 5th edition. Goodheart and Willcox. ISBN:978-1-64564-165-0

Other Resources

Alldata and Mitchell Pro-Demand Online Automotive Databases
State of California Bureau of Automotive Repair's "Write it Right" online work order preparation guide

Class Size Information**Class Size**

32

Class Size Category

G - Large lab 32

Diversity and Inclusion**Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.**

This course provides a particular focus on the expanding opportunities available to special population students in the automotive aftermarket industry; in particular, it discusses the changes that have taken place over the past two decades that have made the diagnostic and repair process for automatic transmissions more analytical and less physically strenuous, and thus more attractive to women who wish to enter the automotive aftermarket industry as drivetrain technicians. This aspect of the industry is stressed in the lecture, and directed study periods associated with the course and reinforced by the time study exercise associated with the lab assignments.

Because the course is presented at our San Jacinto auto shop facility, it is worth noting that we have spent a great deal of time and effort in making the facility and the equipment it contains more user friendly for everyone, but in particular for members of special populations who might lack the physical strength that might have been required in the past. For example, we have made strides in procuring tools and equipment that increase leverage and reduce the risk of physical injury; the drivetrain lifts, holding fixtures and pneumatic tools that we purchased for use in transmission and transaxle repair are good examples of how this initiative was carried out for this course.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.

The department utilizes a number of different types of instructional tools in this course, including accessible manufacturer training modules, many of which are presented by people who represent diverse groups, PowerPoint presentations, and physical demonstrations performed in both the classroom and the laboratory setting; this combination is intended to accommodate students who possess different learning styles and intellectual abilities. The evaluation of the student's performance in the course is based on a diverse set of competency measurements ranging from online quizzes that usually allow students multiple attempts, to daily or weekly evaluation of student performance during laboratory exercises and a final performance evaluation whenever possible. A written final that is presented in the same style as the certification exams used by our industry is also administered, and the student's final grade for the course is based on a combination of all of these inputs; our intention is to be able to evaluate our student's abilities in the most equitable way possible while making accommodation for their ability to perform differently on the most diverse combination of assessment methods that we can devise. For example, one of the Final Performance assessments for this course is a test of the student's ability to perform an electronic relearn of garage shift adapts. There is no written component to this assessment; either the student will be able to perform the task in a professional fashion or not.

Our students work in teams of three or four while performing their lab exercises. We make every effort to encourage diversity in the composition of these teams; it is our goal to prepare students for employment in an industry sector which has always been more diverse than almost any other and is becoming more so.

Interactions**Explain how the course will incorporate student-to-student interaction.**

Because of the limited number of workstations that we are able to make available to our students, many of the tasks required to successfully complete the course need to be performed by having the students work together in teams of three or four. We encourage diversity in these groups and try to engineer it into them; we have experienced an influx of female students in recent years, and we have found that they are generally accepted into these teams with open arms. Simply put, they are usually the best students, for a variety of different reasons. Our goal is to ensure that the students who compose these teams work in harmony with one another by the time the semester comes to a close; the industry we serve depends on a technician's ability to do this, and success is very difficult without this ability.

Explain how the course will incorporate instructor-to-student interaction.

A large part of the instructor's job is to demonstrate the proper procedures used to perform the various tasks required by this course such as disassembling a hydraulic valve body or a wet-clutch pack and successfully reassembling the units; this provides a considerable amount of interaction between the instructor and the students in the shop setting. The instructor is also physically present in the lab area while the students are completing their lab sheets and offers a significant amount of coaching about how the students might proceed to perform their tasks in an easier or more efficient manner.

Explain how the course will incorporate student-to-content interaction.

Since a large proportion of this course is composed of performing actual physical tasks on automatic transmissions or transaxles, students will need to apply the concepts that they have learned through their reading assignments, classroom instruction and physical demonstration to the actions that they perform with their own hands. This aspect of the course incorporates student-to-content interaction in a way that few other courses are able to do.

Explain how the course will incorporate student-to-self interaction (metacognitive).

Success at automotive repairs in general, and transmission or transaxle repair in particular, are judged on the basis of the quality of the repair and also on how quickly it can be performed; this tends to encourage the student who is learning their craft to question the methods they are utilizing to perform diagnosis and repair tasks and to try to improve their own efficiency while doing so. The industry we serve provides powerful incentives, financial and otherwise, that encourage individuals to work in as intelligent a manner as possible; we introduce those incentives to the student as a part of this course.

Key: 391