San Bernardino Valley college
Curriculum Approved: January 27, 2003
Last Updated: December 2002

I. COURSE DESCRIPTION:

A. Department Information:

Division:	Technical
Department:	Automotive
Course ID:	AUTO 076x3
Course Title:	Automatic Transaxles Front Wheel Drive
Lecture	1-3 hours
Laboratory	3-9 hours
Units:	2-6
Prerequisite:	None

B. Catalog and Schedule Description:
Theory and practical work on front wheel drive automatic transaxles in automobile applications. Course offers preparation information for the Automotive Service Excellence (ASE) A2 certification test.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: Three

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of the 1st enrollment, the student will be able to:

A. Demonstrate appropriate shop and job safety techniques.
B. Interpret general automatic transaxle failures and document the diagnosis.
C. Perform general maintenance and adjustments on transaxles.
D. Perform in-vehicle transaxle diagnosis and repair.
E. Analyze off-vehicle transaxle repair.
F. Demonstrate job search and retention skills.

Upon completion of the 2nd enrollment, the student will be able to:

A. Operate simple electronic transaxle diagnostic equipment.
B. Analyze failure codes and research repair documentation.
C. Differentiate between reusable and defective parts.
D. Demonstrate interview skills.

Upon completion of the 3rd enrollment, the student will be able to:

A. Operate complex electronic transaxle diagnostic equipment.
B. Perform a major recondition with minimal assistance from instructor.
C. Research front wheel drive automatic transaxle failures and upgrade transaxle as needed.

IV. COURSE CONTENT:

A. Introduction to Automatic Transaxle
   1. Course overview
   2. Assessment and certification
   3. Class rules
   4. Career opportunities and continuing education
   5. Industry ethics
B. Safety Practices Review
   1. Shop and specific procedures
   2. Hazardous materials
      a) Types
      b) Storage
      c) MSDS
      d) Handling
      e) Emergency procedures
   3. Vehicle specific procedures

4. Power and hand tools
5. Personal safety

C. Automatic Transaxle Diagnosis
1. Overview of transaxle operation
2. Proper safety procedures
3. Diagnostic equipment and special tools
4. Inspect, analyze symptoms, diagnose and service sub components and assemblies.
   a) Customer complaints
   b) Fluid usage
   c) Pressure test
   d) Torque converter
   e) Lock-up torque converter
   f) Electrical, mechanical, and vacuum control systems
   g) Vibrations
   h) Torque specifications

D. Transaxle Maintenance and Adjustments
1. Overview of maintenance and adjustment procedures
2. Proper safety procedures
3. Diagnostic equipment and special tools
4. Inspect, analyze symptoms, diagnose and service sub components and assemblies.
   a) Manual shift valve
   b) Throttle valve
   c) TV linkages or cables
   d) Gear selector indicator
   e) Transaxle service
   f) Torque specifications

E. In-vehicle Transaxle Repair
1. Overview of procedures
2. Proper safety procedures
3. Diagnostic equipment and special tools
4. Inspect, analyze symptoms, diagnose and service sub components and assemblies
   a) Vacuum modulator
   b) Vacuum hoses and lines
   c) Governor Assembly
   d) External seals and gaskets
   e) Extension housing
   f) Fluid checks
   g) Speedometer gear/VSS
   h) Valve body
   i) Servos
   j) Accumulators
   k) Electronic components
   l) Electrical components
   m) Power train mounts
   n) Parking pawl
   o) Torque specifications

F. Off-vehicle Transaxle Repair
1. Overview of procedures
2. Proper safety procedures
3. Diagnostic equipment and special tools
4. Perform
   a) R & R transaxle
   b) R & R torque converter

c) Disassemble and inspect transaxle
d) Assemble transaxle

5. Inspect, analyze symptoms, diagnose and service sub components and assemblies
   a) Oil pump
   b) Flex plate
   c) Converter
   d) Transaxle cooling system
   e) Gear train shafts, bushings, sealing rings and case
   f) Drive links
   g) Bearings
   h) Final drive
   i) Endplay or preload
   j) Thrust washers
   k) Bushings
   l) Vents
   m) Mating surfaces
   n) Clutch drum, pistons, check-balls, springs, retainers, seals, frictions and pressure plates
   o) Clutch pack clearance
   p) Air test
   q) One-way clutch/sprag
   r) Bands
   s) Drums
   t) Torque specifications

V. METHODS OF INSTRUCTION:

A. Lecture
B. Read text book and service manuals
C. Small and large group discussions
D. Manufacturer's video and computer base instructions
E. Lab demonstrations

VI. TYPICAL ASSIGNMENTS:

A. Read textbook and answer questions at the end of each chapter.
   Typical Question: Explain the operation of the torque converter.
B. Class discussion
   Typical Topic: What is a stall test and how is it performed?
C. Manufacturer's video instruction
   1. Answer pre-test to video on front wheel drive transaxle
   2. Answer post-test to video, correct test, and discuss answers
   3. Complete CD ROM training for front wheel drive transaxle and review
D. Lab assignments
   Complete all required task sheets set by NATEF standards
   1. Prepare to remove a front wheel drive automatic transaxle.
   2. Perform a transaxle recondition on a front wheel drive transaxle.

VII. EVALUATION(S):

A. Methods of evaluation:
   1. Chapter review questions
   2. Assigned laboratory projects
   3. Quizzes
   4. Midterm examination
   5. Final examination
      Typical Question:
      Describe the purpose of the pressure regulator valve.

6. Writing assignments
   Typical Assignments:
   a) Research paper pertaining to automatic transaxles.
   b) Compose a repair order detailing customers needed repairs.

B. Frequency of evaluation:
1. Textbook chapters review questions, approximately 20 chapters with ten questions per chapter
2. Weekly assigned laboratory projects
3. Four in class quizzes with ten critical thinking questions
4. One midterm examination
5. One final examination
6. One writing assignment

C. Levels of evaluation upon repetition:
First enrollment students are expected to:
1. Recognize shop safety hazards.
   Typical Questions:
   a) What is the purpose of wearing safety glasses?
   b) What type of footwear is allowed in the auto shop?
2. Interpret general front wheel drive automatic transaxle failures and document.
   Typical Questions:
   a) A 4T60E transmission has no reverse, what is the most likely cause and why?
   b) A 4xod transmission has higher than normal shift points, what determines the speed and timing of the shifts?
3. Perform general maintenance and adjustments on front wheel drive transaxle.
   Typical Questions:
   a) How often should a front wheel drive automatic transaxle be serviced?
   b) Why should you adjust bands?
4. Perform in-vehicle front wheel drive transaxle repairs.
   Typical Questions:
   a) What tools would be used to check pressure on an electronic front wheel drive automatic transaxle? Demonstrate that procedure.
   b) What is the importance of a torque wrench? Demonstrate the proper use.
5. Analyze off-vehicle transaxle repair.
   Typical Assignment and Question:
   a) Inspect component and determine possible cause of failure in a detailed report.
   b) What is the endplay on the given transaxle?
6. Demonstrate job search and retention skills.
   Typical Assignments.
   a) Create a resume that gives a prospective employer your educational history, work experience, and the reason they should hire you.
   b) Prepare for a mock interview where you will be asked questions that pertain to a specific job description.

Second Enrollment students are expected to:
1. Operate simple electronic transaxle diagnostic equipment.
   Typical Assignments:
   a) Complete a performance test using the scan tool and retrieve and interpret stored data.
   b) Demonstrate the use of a multi-meter by testing the resistance of a shift solenoid.
2. Analyze failure codes and research repair documentation.
   Typical Question:
   Describe the failure code po137 for a 2002 Buick Le Saber and list the possible causes for this failure code.
3. Differentiate between reusable and defective parts.

Typical Assignments:
a) Tear down a 4T60E transaxle and list the defective parts.
b) Inspect pump A & pump B, which, if any, is reusable and which should be replaced and why?

Third enrollment students are expected to:

1. Operate complex electronic transaxle diagnostic equipment.
   Typical Assignments:
   a) Perform a diagnostic check using the Shaffer shifter and determine the possible cause for the malfunction.
   b) Setup an automatic transaxle on the dyno, perform a system check, and determine if the transaxle is operating to factory specification.
2. Perform a major recondition with minimal assistance from instructor.
   Typical Assignments:
   a) Teardown and recondition automatic transaxle, install in-vehicle, and verify proper operation.
   b) Remove and replace automatic transaxle according to factory specification.
3. Research front wheel drive automatic transaxle failures and upgrade transaxle as needed.
   Typical Questions:
   a) What updates are available for the 4T65E automatic transaxle?
   b) What are some of the failures that commonly occur with a 4T60E transaxle? What are the corrections?

VIII. TYPICAL TEXT(S):

Mark Hambaum, Automatic Transmissions and Transaxles Set and Shop Manuals, Prentice Hall, Upper Saddle River, New Jersey, 2003
Tom Birch and Chuck Rockwood, Automatic Transmission and Transaxles, 2nd Edition, Prentice Hall, Upper Saddle River, New Jersey, 2002
Chris Johanson and James E. Duffy, Automatic Transmissions and Transaxles, Goodheart-Wilcox, Tinley Park, Illinois, 2002
Jack Erjavec, Automatic Transmission and Transaxle, 2nd Edition, Delmar/Thompson Learning, Albany, New York, 1999

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

Safety glasses are to be worn in the lab area at all times.