I  INTRODUCTION

A. A study of automotive clutches, clutch operation devices, standard transmissions, transaxles, and differentials with emphasis on the diagnosis and repair of transmissions and drivelines. May be taught with manufacture specific instructions.

B. Automotive Manual Drive Trains and Axles (AUMT 2413) is a required course for the completion of a two year Associate of Applied Science degree in Automotive Mechanic/Technician or a Level I or Level II certificate of completion in the Automotive Technician Program.

C. This course is occupationally related and serves as a preparation for a career in the Automotive Service and Repair field.

D. Prerequisites: This course has a prerequisite of AUMT 1405 or consent of the Department Chair.

E. Alphanumeric coding used throughout this module book denotes integration of SCANS occupational competencies (C1, etc.) and Foundation skills (F1, etc.).

II  LEARNING OUTCOMES

Upon successful completion of this course, Manual Drive Trains and Axles, the student will:

A. Utilize appropriate safety procedures, determine driveline problems by operating the vehicle. (C7) (F9)

B. Make positive diagnosis by disassembly and inspections. (C7) (F9)

C. Diagnosis and service clutches, transmissions, transaxles, and differentials. (C7, 18, 19)

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D. Service velocity joints and universal joints. (C7, 18, 19)

E. Identify and describe the function of various components of automotive transmissions, transaxles and drive lines, including front wheel drives. (C7) (F6)

F. Properly and safely use and maintain tools, equipment, and service manuals. (C3, 5, 15, 18, 19, 20) (F1, 2, 3, 8, 9, 10)

G. Practice shop safety. (C5, 6, 7) (F6, 8, 9)

H. Discuss transmission/transaxle gears. (C7) (F6)

I. Inspect, diagnose, and repair differentials, axles and four-wheel-drive systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)

J. Inspect, diagnose, and repair electrical and electronic systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)

III INSTRUCTIONAL MATERIALS

A. Text:

See:  www.ctcd.edu/books

B. Supplemental Reading: As assigned by the instructor.

C. References: As selected by the instructor.

D. Audio-visual aids: (Recommended)

1. “Drive Trains”, Shopware Educational Systems #SW630S (Computer Aided Training)
2. “Clutch Assembly”, Bergwall #412 (Filmstrip)
3. “Clutch Operation and Service”, BWD Automotive Corp. Tape 1 (Video)
4. “Clutch Diagnosis and Repair”, BWD Automotive Corp. Tape 2 (Video)
5. “Clutch Operation and Service”, Meridian Ed. Corp. #5185 (Video)
6. “Manual Transmissions”, Meridian Ed. Corp. #5186 (Video)
7. “Servicing the Standard Transmission”, Prentice Hall #1110, 4 parts (Filmstrip)
8. “GM Transaxles”, Voc Media #30896-127, 3 parts (Video)
9. “Front Wheel Drive”, Bergwall #460 (Filmstrip)
10. “Front Wheel Drive Overhaul”, Bergwall #463 (Filmstrip)
11. “Drive Shafts and Universal Joints”, Bergwall #429 (Filmstrip)
12. “Servicing the Drive Line”, Prentice Hall #1151, 2 parts (Filmstrip)
IV COURSE REQUIREMENTS

A. Your first responsibility is scholarship. The grade you receive will be the result of your efforts both in the classroom and in the laboratory.

B. This course is designed to require a steady, continuous effort form the student. Class participation, initiative, attendance, and work efforts will be considered in grade computation.

C. Reading and study assignments will be made by the instructor. Reading of all study assignments is required, as well as specific tasks outlined by the instructor or listed on handouts, or laboratory activity sheets. Specific reading assignments will be assigned by the instructor. Students are required to complete these assignments by the time specified by the instructor. Quizzes may be given on any or all reading assignments.

D. The study of a subject is not limited to the classroom, laboratory, or limits of the syllabus. Each student should seek out and study all available material available on the subject being taught. This might include use of the Internet or the library. In general, two hours of study outside the regular class period is recommended for each hour of classroom work.

E. Students are required to attend class and laboratory sessions regularly. Those who fail to do so may be dropped from the course with a grade of “FN”.

F. Students are required to be present for all examinations. See paragraph V (Examinations) for additional information.

G. Laboratory learning activities (lab tasks) will be completed on an individual basis except when limited by tools and/or materials. Learning activities will be subjectively graded by the instructor. Students assigned to a group must be present at all times when the project is being worked on. Students who are not present while a learning activity is in progress may be given a “0” for that activity. Students are required to complete all laboratory assignments by the time specified by the instructor.
EXAMINATIONS

A. There will be a minimum of three major examinations:

1. Three Week Exam
2. Mid Term Exam
3. Final Exam (this is a comprehensive exam)
4. Additional examinations may be given if the instructor determines it is necessary for proper evaluation of the students in the class.

B. Students must be present for all examinations. Make up examinations will not be given. Students who know they will be absent on the day of an examination must make arrangements with the instructor prior to the absence. Students who are absent on the day of the examination due to illness or other extenuating circumstances must present to the instructor an acceptable reason for the absence on the day following the absence.

C. Students without an excused absence will be given a zero for that examination.

D. Students must take the final examination to receive a grade for the course.

VI SEMESTER GRADE COMPUTATIONS

A. Written examinations will count 45% of the student’s overall final grade.

B. Practical, hands-on lab work will count 45% of the student’s overall final grade.

C. Incentive points will count 10% of the student’s overall final grade. Incentive points are earned by doing additional work, written assignments, class participation, demonstrated initiative, and positive attitude. Points will be deducted for each unexcused absence, each written assignment not turned in, each tardy, and each failure to secure tools and clean work areas.

D. Grade Computations (Example)

1. Written Exams (45%) (maximum 100 points)
   1st Exam 90
   2nd Exam 90
   3rd Exam +90
   $270 \div 3 = 90$ average
2. Lab score (45%) (maximum 100 points)
   Lab score = 80
   45% of 80 = 36 points for lab score

3. Incentive Score (10%) (maximum 100 points)
   Incentive score = 82
   10% of 82 = 8.2 points for Incentive Score

4. Final Overall Grade Computation
   Written Exam: 40.5 Points
   Lab Score: 36.0 Points
   Incentive Score: 8.2 Points
   84.7 Total Points = a letter grade of “B”

E. Points/Score Equivalents:

<table>
<thead>
<tr>
<th>POINTS</th>
<th>GRADE</th>
<th>POINTS PER SEMESTER HOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100</td>
<td>A</td>
<td>4</td>
</tr>
<tr>
<td>80-89</td>
<td>B</td>
<td>3</td>
</tr>
<tr>
<td>70-79</td>
<td>C</td>
<td>2</td>
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<td>60-69</td>
<td>D</td>
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<td>0-59</td>
<td>F</td>
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<tr>
<td>WITHDRAWAL</td>
<td>W</td>
<td>0</td>
</tr>
<tr>
<td>INCOMPLETE</td>
<td>I</td>
<td>0</td>
</tr>
</tbody>
</table>

VII NOTES AND ADDITIONAL INSTRUCTIONS FROM THE INSTRUCTOR

A. Course Withdrawal: It is the student’s responsibility to officially withdraw from a course if circumstances prevent attendance. Any student who desires to, or must, officially withdraw from a course after the first scheduled class meeting must file a Central Texas College Application for Withdrawal (CTC Form 59). The withdrawal form must be signed by the student.

CTC Form 59 will be accepted at any time prior to Friday of the 12th week of classes during the 16-week fall and spring semester. The deadline for sessions of others lengths is:

- 10-week session: Friday of the 8th week
- 8-week session: Friday of the 6th week
- 5-week session: Friday of the 4th week
The equivalent date (75% of the semester) will be sued for session of other lengths. The specific last day to withdraw is published each semester in the Schedule Bulletin.

A student who officially withdraws will be awarded the grade of “W” provided the student’s attendance and academic performance are satisfactory at the time of official withdrawal. Students must file a withdrawal application with the College before they may be considered for withdrawal. A student may not withdraw from a class for which the instructor has previously issued the student a grade of “F” or “FN” for nonattendance.

B. Administrative Withdrawal: An administrative withdrawal may be initiated when the student fails to meet College attendance requirements. The instructor will assign the appropriate grade on CTC Form 59 for submission to the registrar.

C. Incomplete Grade: The College catalog states, “An incomplete grade may be given in those cases where the student has completed the majority of the course work but, because of personal illness, death in the immediate family, or military orders, the student is unable to complete the requirements for a course...” Prior approval from the instructor is required before the grade of “I” for Incomplete is recorded. A student who merely fails to show for the final examination will receive a zero for the final and an “F” for the course.

D. Cellular Phones and Beepers: Cellular phones and beepers will be turned off while the student is in the classroom or laboratory.

E. American’s With Disabilities Act (ADA): Disability Support Services provide services to students who have appropriate documentation of a disability. Students requiring accommodations for class are responsible for contacting the Office of Disability Support Services (DSS) located on the central campus. This service is available to all students, regardless of location. Explore the website at www.ctcd.edu/disability-support for further information. Reasonable accommodations will be given in accordance with the federal and state laws through the DSS office.

F. Instructor Discretion: The instructor reserves the right of final decision in course requirements.

G. Civility: Individuals are expected to be cognizant of what a constructive educational experience is and respectful of those participating in a learning environment. Failure to do so can result in disciplinary action up to and including expulsion.
H. Absence from the class may be unavoidable in some situations. These include illness, military/civilian job requirements, or a death in the immediate family. Documentation is required in the case of excused absences for job requirement’s, excuses will be on company letterhead stationary signed by the immediate supervisor stating the reason for the absence for civilian jobs.
Excuses for military personnel must be signed by the 1st Sergeant or the Company Commander. In cases of illness, one day absences may be excused on a statement from the individual stating the reason. For more than one day of illness, the individual must have a statement from the doctor treating the illness.

VIII COURSE OUTLINE

A. **Lesson One:** Introduction: Introduction, Safety, Theory, and Clutches

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will:

   a. Identify and describe the function of various components of automotive transmissions, transaxles and drive lines; including front wheel drives. (C7) (F6)
   
   b. Discuss transmission/transaxle gears. (C7) (F6)

2. **Learning Activities:**

   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   
   b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
   
   c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   
   d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
   
   e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. **Equipment and Materials:**

   a. Assorted clutch designs
   
   b. Mechanics tool kits
   
   c. Special tools (as required)
   
   d. Service publications
   
   e. Safety equipment
   
   f. Vehicle with standard transmission/transaxle
   
   g. TV/VCR (as required)
   
   h. Others as required by the instructor
4. **Audio Visual Aids:** (Recommended)
   
a. To be selected by the instructor from those listed in Section III D above.
   
b. Others as selected by the instructor.

5. **Lesson Outline:**
   
a. Introduction
b. Safety
c. Tools and equipment
d. Drive Train Theory
   
   (1) Introduction
   (2) Engine
   (3) Gears
   (4) Transmission
   (5) Clutch
   (6) Drive line
   (7) Rear axles
   (8) Differentials
   (9) Drive axles
   (10) Bearings
e. Clutches
   
   (1) Location
   (2) Design
   (3) Linkages
   (4) Operation
   (5) Service
   
   (a) Diagnosis
   (b) Controls
   (c) Pressure Plate
   (d) Disc
   (e) Flywheel
   (f) Removal
   (g) Input Shaft
   (h) Bearings and Bushings
   (i) Release Bearing
   (j) Service

B. **Lesson Two:** Transmissions and Transaxles

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will:
a. Utilizing the appropriate safety procedures, the student will determine drive line problems by test driving the vehicle. (C7) (F9)
b. Identify and describe the function of various components of automotive transmissions, transaxles and drive lines, including front wheel drives. (C7) (F6)
c. Properly and safely use and maintain tools and equipment. (C18, 19, 20)
d. Practice shop safety. (C5, 6, 15, 18, 19, 20) (F2, 8, 9, 10)
e. Discuss transmission/transaxle gears. (C7) (F6)
f. Inspect, diagnose, and repair differentials, axles and four wheel drive systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)

2. Learning Activities:

a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:

a. Mechanics tool kits
b. Special tools (as required)
c. Service publications
d. Safety equipment
e. Transmission and transaxle assortment
f. Vehicle with transmission/transaxle
g. TV/VCR (as required)
h. Others as selected by the instructor

4. Audio-Visual Aids: (Recommended)

a. To be selected by the instructor from those listed in Section III D above.
b. Others as selected by the instructor.
5. **Lesson Outline:**

a. Introduction  
b. Types of transmissions/transaxles  
c. Synchronizers  
d. Transmission design  
e. Operating principles  
f. Gear shift linkage  
g. Transaxle operation  
h. Servicing transmissions and transaxles  
  (1) Diagnostics  
  (2) Trouble-shooting  
  (3) Removal  
  (4) Disassembly  
  (5) Inspection  
  (6) Cleaning  
  (7) Reassembly  
  (8) Installation

C. **Lesson Three:** Front Drive Axles

1. **Learning Outcomes:** Upon successful completion of this lesson, the student will:

   a. Utilize appropriate safety procedures, the student will determine drive line problems by test driving the vehicle. (C7) (F9)  
   b. Make positive diagnosis by disassembly and inspection. (C7) (F9)  
   c. Make proper repair to clutches, transmissions, transaxles and differentials. (C7, 18, 19)  
   d. Identify and describe the function of various components of automotive transmissions, transaxles and drive lines, including front wheel drives. (C7) (F6)  
   e. Properly and safely use and maintain tools and equipment. (C18, 19, 20)  
   f. Practice shop safety. (C5, 6, 7) (F6, 8, 9)  
   g. Discuss transmission/transaxle gears. (C7) (F6)  
   h. Inspect, diagnose, and repair differentials, axles and four wheel drive systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)

2. **Learning Activities:**

   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)  
   b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:

a. Mechanics tool kits
b. Special tools (as required)
c. Service publications
d. Safety equipment
e. Front drive axle
f. Vehicles with front drive axles
g. TV/VCR (as required)
h. Others as selected by the instructor

4. Audio-visual Aids: (Recommended)

a. To be selected by the instructor from those listed in Section III D above.
b. Others as selected by the instructor.

5. Lesson Outline:

a. Introduction
b. Construction
c. Drive axles
d. CV-joints
   (1) Types
   (2) Designs
   (3) Outboard
   (4) Inboard
e. FWD wheel bearings
f. Service
   (1) Diagnosis
   (2) Visual inspection
   (3) Removal
   (4) Inspection
   (5) Service kits
   (6) Service procedures
   (7) Bearings
D. **Lesson Four**: Drive Shafts and U-joints

1. **Learning Outcomes**: Upon successful completion of this lesson, the student will:
   
   a. Utilizing the appropriate safety procedures, the student will determine drive line problems by test driving the vehicle. (C7) (F9)
   b. Make positive diagnosis by disassembly and inspection. (C7) (F9)
   c. Make proper repair to clutches, transmissions, transaxles, and differentials. (C7, 18, 19)
   d. Make proper repairs to constant velocity joints and universal joints. (C7, 18, 19)
   e. Identify and describe the function of various components of automotive transmissions, transaxles and drive lines, including front wheel drives. (C7) (F6)
   f. Properly and safely use and maintain tools, equipment, and service manuals. (C3, 5, 15, 18, 19, 20) (F1, 2, 3, 8, 9 12)
   g. Practice shop safety. (C5, 6, 7) (F6, 8, 9)
   h. Inspect, diagnose, and repair differentials, axles and four wheel drive systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)

2. **Learning Activities**:

   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
   c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
   e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. **Equipment and Materials**:

   a. Mechanics tool kits
   b. Special tools (as required)
   c. Service publications
   d. U-joint assortment
   e. Drive shafts
f. Vehicles with U-joint and drive shafts  
g. TV/VCR (as required)  
h. Others as selected by the instructor  

4. Audio-visual Aids: (Recommended)  

a. To be selected by the instructor from those listed in Section III D above.  
b. Others as selected by the instructor.  

5. Lesson Outline:  

a. Introduction  
b. Drive shafts  
   (1) Construction  
   (2) Types  
   (3) Service  
c. Universal joints  
   (1) Types  
   (2) Service  

E. Lesson Five: Differentials, Drive Axles, and Four-Wheel Drives  

1. Learning Outcomes: Upon successful completion of this lesson, the student will:  

a. Utilizing appropriate safety procedures, the student will determine drive line problems by test driving the vehicle. (C7) (F9)  
b. Make positive diagnosis by disassembly and inspection. (C7) (F9)  
c. Make proper repair to clutches, transmissions, transaxles and differentials. (C7, 18, 19)  
d. Properly and safely use and maintain tools, equipment, and service manuals. (C3, 5, 15, 18, 19, 20) (F1, 2, 3, 8, 9, 12)  
e. Practice shop safety. (C5, 6, 7) (F6, 8, 9)  
f. Discuss transmission/transaxle gears. (C7) (F6)  
g. Inspect, diagnose, and repair differentials, axles and four-wheel drive systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)  

2. Learning Activities:  

a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)  
b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:

a. Mechanics tool kit
b. Special tools (as required)
c. Service publications
d. Safety equipment
e. Differentials
f. Axles
g. Vehicle with differentials
h. Vehicle with 4-wheel drive
i. Others as selected by the instructor

4. Audio-visual Aids: (Recommended)

a. To be selected by the instructor from those listed in Section III D above.
b. Others as selected by the instructor.

5. Lesson Outline:

a. Introduction
b. Differential Theory
   (1) Function
   (2) Components
   (3) Operation
   (4) Axle Housing
   (5) Gears
   (6) Bearings
   (7) Transaxles
   (8) Limited slip differential
   (9) Drive axles and bearings
c. Differential Service
   (1) Diagnosis
   (2) In-vehicle service
   (3) Out-of-vehicle service
   (4) Removal
   (5) Inspection
d. Four-wheel Drive Operation and Theory
   (1) Design
   (2) Types
   (3) Transfer cases
   (4) Locking wheel hubs
   (5) Interaxle differentials
   (6) Suspension

E. Advanced four-wheel drive control systems
   (1) Introduction
   (2) Models
   (3) 4WD systems
   (4) Viscous couplings
   (5) Newer 4WD systems

F. Four-wheel Drive Service
   (1) Diagnosis
   (2) Inspection
   (3) Axle housing and differential
   (4) Shift controls
   (5) Transfer codes
      (a) Removal
      (b) Disassembly
      (c) Assembly
   (6) Viscous coupling
   (7) Front axles and hubs
   (8) Wheel bearings
   (9) Modifications
   (10) Advanced system

Lesson Six: Drive Train Electrical and Electronic Systems

1. Learning Outcomes: Upon successful completion of this lesson the student will:

   a. Make positive diagnosis by disassembly and inspection. (C7) (F9)
   b. Make proper repair to clutches, transmissions, transaxles and differentials. (C7, 18, 19)
   c. Make proper repairs to constant velocity joints and universal joints. (C7, 18, 19)
d. Identify and describe the function of various components of automotive transmissions, transaxles and drive lines, including front wheel drives. (C7) (F6)
e. Properly and safely use and maintain tools, equipment, and service manuals. (C3, 5, 15, 18, 19, 20) (F1, 2, 3, 8, 9, 12)
f. Practice shop safety. (C5, 6, 7) (F6, 8, 9)
g. Inspect, diagnose, and repair differentials, axles and four-wheel drive systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)

2. Learning Activities:
   a. The student will complete reading assignments as assigned. (F1, F11, C5, C6)
   b. The student will study the words/terms and complete written assignments specified by the instructor. (F1, F11, C5, C6)
   c. The student will attend classroom lectures and participate in classroom discussion. (F5 thru 7, F9, F10, C1, C5 thru 7)
   d. The student will observe demonstrations performed by the instructor. (F5, F10, C5, C6, C14)
   e. The student will complete laboratory learning activities assigned by the instructor. See the laboratory learning activity list attached. (F1 thru F17, C1, C3, C5 thru 9, C14 thru 16, C18 thru 20)

3. Equipment and Materials:
   a. Mechanics tool kit
   b. Special tools (as required)
   c. Service publications
   d. Safety equipment
   e. Vehicle with electronic transmission
   f. Electronic components (selected by the instructor)
   g. Multimeters
   h. Others as selected by the instructor

4. Audio-visual Aids: (Recommended)
   a. To be selected by the instructor from those listed in Section III D above.
   b. Others as selected by the instructor.

5. Lesson Outline:
   a. Introduction
   b. Basic Electricity (Review)
   c. Basic Electronics (Review)
   d. Switches/Controls
e. Circuits
f. Shift Blocking
g. Electrical Clutches
h. Other Electronic Systems
i. Diagnosis
j. Service and Repair
INSTRUCTIONS FOR ALL STUDENTS: Student texts, notes, and service manuals may be used in performance of the tasks. The instructor must verify satisfactory completion of each task by entering the date and his initials in the date column for each task. The instructor will not verify satisfactory completion of the task until all standards have been met. The grade earned will be entered in the task# column.

To meet minimum requirements, the student must correctly complete each task listed below one time. Each performance exam will count 5.9 points. A maximum of 100 points will be awarded. NOTE: Failure to follow instructions, record required data, use correct tools in correct manner, clean work area, secure tools and equipment, absence, or unsafe act will result in a deduction of points from your total lab score.

<table>
<thead>
<tr>
<th>TASK #</th>
<th>LEARNING ACTIVITY DESCRIPTION</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Identify and explain the components of the power train (rear wheel drive and front wheel drive) on a vehicle selected by the instructor. Use a separate sheet of paper and record the information requested below for each vehicle. Type of Drive System Component Function</td>
<td></td>
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<tr>
<td>2.</td>
<td>Identify different type of gears selected by the instructor.</td>
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<tr>
<td>3.</td>
<td>Identify and explain the functions of various clutches and their components selected by the instructor. Use a separate sheet of paper and record the following for each type clutch. Type of clutch Name of Component Function</td>
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<tr>
<td>4.</td>
<td>Measure/adjust clutch free travel on a vehicle selected by the instructor. Record the required specifications and your final adjustments on a separate sheet of paper.</td>
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<tr>
<td>5.</td>
<td>Perform clutch problem diagnosis on a vehicle selected by the instructor. Record the results of the diagnosis on a separate sheet of paper.</td>
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<tr>
<td>6.</td>
<td>Remove, test/measure, and reinstall a clutch on a vehicle selected by the instructor. This includes flywheel inspection, measuring pressure plate release lever height, measuring clutch housing face and inside diameter for alignment. Use a separate sheet of paper and record all required specifications and torques for the vehicle you use.</td>
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### Tasks

<table>
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<tr>
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<tbody>
<tr>
<td>7. Remove and install a transmission and/or a transaxle on a vehicle selected by the instructor.</td>
<td></td>
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<tr>
<td>8. Disassemble, inspect, and reassemble a transmission and a transaxle selected by the instructor. Use a separate sheet of paper and record all torque values, the specifications for each component. Prepare a list of parts required to repair each transmission and transaxle disassembled.</td>
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<tr>
<td>9. Use an inclinometer to check the drive line angle on a vehicle selected by the instructor. Record the specifications and the angles you measure on a separate sheet of paper.</td>
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<tr>
<td>10. Remove and reinstall a drive shaft on a vehicle selected by the instructor.</td>
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<tr>
<td>11. Remove, inspect and reinstall a CV joint on a vehicle selected by the instructor. Record the results of your inspection on a separate sheet of paper.</td>
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<tr>
<td>12. Remove, inspect and reinstall a U-joint on a rear wheel drive vehicle selected by the instructor.</td>
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<tr>
<td>13. Identify and explain the functions of the components on an axle and differential assembly. Use a separate sheet of paper and record the following information: Name of component Function</td>
<td></td>
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<tr>
<td>14. Remove and install and axle on a vehicle selected by the instructor.</td>
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<tr>
<td>15. Disassemble, inspect, adjust, and reassemble a differential assembly selected by the instructor. Use a separate sheet of paper and record all specifications and the results of your inspection/measurements. Prepare a list of parts to return the differential to a serviceable condition.</td>
<td></td>
</tr>
<tr>
<td>16. Diagnose and repair an electronic transmission or transaxle as directed by the instructor.</td>
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</tr>
<tr>
<td>17. Properly and safely use and maintain tools and equipment and practice shop safety. Graded throughout the course.</td>
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</tbody>
</table>

**TOTAL POINTS/GRADE AWARDED (Possible 100 points)**
CENTRAL TEXAS COLLEGE
INDUSTRIAL TECHNOLOGY COMPETENCY PROFILE

<table>
<thead>
<tr>
<th>Program:</th>
<th>Automotive Technician</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course:</td>
<td>AUMT 2413 Automotive Drive Trains and Axles, 4 Credits (128 clock hours)</td>
</tr>
<tr>
<td>Entry Occupation:</td>
<td>Automotive Repair Helper/Apprentice</td>
</tr>
<tr>
<td>Instructor:</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Name:</th>
<th>SSAN:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Enrolled:</td>
<td>Date Completed/Withdraw:</td>
</tr>
<tr>
<td>Total Hours Absent:</td>
<td>Final Grade</td>
</tr>
</tbody>
</table>

RATING SYSTEM

The instructor will evaluate the student by placing a check mark in the appropriate number block to indicate the student’s degree of competency. The rating for each task reflects the instructor’s evaluation of employability readiness rather than the grade given in the class. The final grade is not an average of ratings. The rating scale listed below will be used to rate the student.

RATING SCALE

1 = 95(A) = Mastered competency: Highly proficient. Can perform task without supervision. Can teach others. Meets or exceeds SCANS requirements.

2 = 85(B) = Mastered Competency: Proficient. Can perform task with limited supervision. Meets most SCANS requirements.

3 = 75(C) = Mastered Competency: Can perform task but requires close supervision. Meets minimum SCANS requirements.

4 = 0(F) = Did NOT master competency: Unable to or did not attempt to perform task. Does not meet SCANS requirements.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>Learning Outcome 1: Utilize appropriate safety procedures, the student will determine drive line problems by test driving the vehicle. (C7) (F9)</td>
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<tr>
<td>Learning Outcome 2: Make positive diagnosis by disassembly and inspection. (C7) (F9)</td>
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<tr>
<td>Learning Outcome 3: Make proper repair to clutches, transmissions, transaxles, and differentials. (C7, 18, 19)</td>
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<td>---------------------------------------------------------------</td>
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<tr>
<td>Learning Outcome 4: Make proper repairs to constant velocity joints and universal joints. (C7, 18, 19)</td>
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</tr>
<tr>
<td>Learning Outcome 5: Identify and describe the function of various components of automotive transmissions, transaxles and drive lines, including front wheel drives. (C7) (F6)</td>
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<tr>
<td>Learning Outcome 6: Properly and safely use and maintain tools, equipment, and service manuals. (C3, 5, 15, 19, 20) (F1, 2, 3, 8, 9, 12)</td>
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<tr>
<td>Learning Outcome 7: Practice shop safety. (C5, 6, 7) (F6, 8, 9)</td>
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<tr>
<td>Learning Outcome 8: Discuss transmission/transaxle gears. (C7) (F1, 6)</td>
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<tr>
<td>Learning Outcome 9: Inspect, diagnose, and repair differentials, axles, and four-wheel-drive systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)</td>
<td></td>
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<tr>
<td>Learning Outcome 10: Inspect, diagnose, and repair electrical and electronic systems. (C5, 6, 7, 15, 18, 19, 20) (F1, 2, 3, 5, 6, 8, 9)</td>
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</table>
Workplace Know-How and Personal Characteristics

The rating system listed below will be used by the Worksite Supervisor to evaluate the student’s workplace know-how and personal characteristics. The Worksite Supervisor will evaluate the student on the following competency (task) listed by circling the appropriate rating from the rating scale below that best describes his/her observation of the student during the entire length of this course for the rated area (task). Enter the date the task was completed in the date column.

Rating Scale

1 = Above Average
2 = Average
3 = Below Average
N/A = Not Observed

<table>
<thead>
<tr>
<th>COMPETENCIES: Effective workers can productively use:</th>
<th>Rating</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources: allocating time, money, materials, space, staff.</td>
<td>1 2 3 N/A</td>
<td></td>
</tr>
<tr>
<td>Interpersonal Skills: working on teams, teaching others, serving customers, leading, negotiating, and working Well with people from culturally diverse backgrounds.</td>
<td>1 2 3 N/A</td>
<td></td>
</tr>
<tr>
<td>Information: acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information.</td>
<td>1 2 3 N/A</td>
<td></td>
</tr>
<tr>
<td>Systems: understanding social, organizational, and technological systems, monitoring and correcting performance, and designing or improving systems.</td>
<td>1 2 3 N/A</td>
<td></td>
</tr>
<tr>
<td>Technology: selecting equipment and tools, applying technology to specific tasks, and maintaining and troubleshooting technologies.</td>
<td>1 2 3 N/A</td>
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<table>
<thead>
<tr>
<th>THE FOUNDATION: Competence requires:</th>
<th>Rating</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Skills: reading, writing, arithmetic and mathematics, speaking and listening.</td>
<td>1 2 3 N/A</td>
<td></td>
</tr>
<tr>
<td>Thinking Skills: thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn, and reasoning.</td>
<td>1 2 3 N/A</td>
<td></td>
</tr>
<tr>
<td>Personal Qualities: individual responsibility, self-esteem, sociability, self-management and integrity.</td>
<td>1 2 3 N/A</td>
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</table>

<table>
<thead>
<tr>
<th>PERSONAL CHARACTERISTICS</th>
<th>Rating</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relations with others: Effectiveness in working with students, instructors, and others; cooperation; shows respect.</td>
<td>1 2 3 N/A</td>
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</table>
**Dependability:** attendance; loyalty; punctuality; adherence to schedules and deadlines; consistency and results; perseverance.

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<th></th>
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<th>N/A</th>
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**Work Attitudes:** willingness to learn; willingness to accept and profit from evaluation; enthusiasm; initiative; commitment; pride in work.

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<th>2</th>
<th>3</th>
<th>N/A</th>
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</table>

**Communication:** listening; speaking; and nonverbal skills; effectiveness in communicating with students, teachers, and others.

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<th></th>
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<th>3</th>
<th>N/A</th>
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</table>

**Personal Hygiene-Grooming:** personal health care and cleanliness, dresses and maintains self appropriately for a business environment.

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<th>1</th>
<th>2</th>
<th>3</th>
<th>N/A</th>
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</thead>
</table>

Based on my observation/evaluation of the student, he/she has: (place a “✓” in the appropriate block).

- Entry level skills now.
- Entry level skills after additional external learning experience.
- Entry level skills after additional course work.
- Entry level skills after additional course work and additional external learning experience.

**Instructor Comments:** (Please provide additional information regarding your evaluation of the student’s performance.)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

**INSTRUCTOR CERTIFICATION**

I certify this competency profile to be true and accurate to the best of my knowledge.

Signature: __________________________ Date: ______________

I have seen this evaluation and discussed it with my Instructor.

Student Signature: __________________________ Date: ______________

**Written Exam**

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<th>First</th>
<th>Second</th>
<th>Final</th>
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