I INTRODUCTION

A. Instruction in the repair, replacement, and/or service of those mechanical or electrical systems. Topics include drive train removal, reinstallation and service; cooling system service and repair; exhaust system service; and emission control systems. Additional topics include wire and connector repair, reading wiring diagrams, and troubleshooting.

B. Auto Body Mechanical and Electrical Service (ABDR 2402) is a required course for the completion of a two year Associate of Applied Science Degree in Auto Collision Repair or a Level I or Level II Certificate of Completion in the Auto Collision Repair Technician Program.

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

D. Prerequisites: This course has a prerequisite or corequisite of ABDR 1419 or consent of the Dept. 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, Auto Body Mechanical and Electrical Service, the student will:

A. Identify mechanical or electrical systems damage. (F9)

B. Repair, replace, and/or service damaged mechanical or electrical systems. (C18, 19)

January 10, 2007
C. Use appropriate test and repair equipment. (C18, 19)

D. Use service publications. (F1)

E. Practice shop safety and properly and safely use and maintain tools and equipment. (F9) (C20)

F. Improves or designs systems. (C17)

G. Explain and use basic electrical and electronic theories. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

H. Locate and identify automotive electrical and electronic circuits and components and use electrical test equipment to test circuits and components. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

I. Service batteries. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

J. Service cooling systems. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

K. Service drive trains. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

L. Service lighting, accessory and body electrical systems. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

M. Service fuel and emission systems. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

N. Service exhaust systems. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

III. INSTRUCTIONAL MATERIALS

A. Text: The instructional materials identified for this course are viewable through www.ctcd.edu/books

B. Supplemental Reading: As assigned by the instructor.

C. References:


D. **Audio-visual aids:** See resource list at end of this module book.

1. "Electricity for Auto Technicians". Bergwall #A26 (5 videos)
2. "Electronics for Auto Technicians", Bergwall #30 (5 videos)
3. "The Electrical Systems", Vocational Media Associates #31374 (video)
5. "Soldering Tools and Techniques",
6. "Testing and Servicing A Battery: Educational Video Network, #6882 (Video)
7. "Servicing Supplemental Air Bag Restraint Systems, Ford Service Training #4150-005 VHS (Video)
8. "Servicing An Exhaust System", Educational Video Network #689V (Video)

E. **Other instructional material:** as selected by the instructor.

**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 from 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.

V 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 tardiness, and each failure to secure tools and clean work areas.

D. Grade Computations (Example):

1. Written Exams (45%) (maximum 100 points)
   - 1st Exam: 90 points
   - 2nd Exam: 90 points
   - 3rd Exam: +90 points (total 270 points)
   - 270 divided by 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
   - Total Points = 84.7
   - Letter grade of “B”

E. Points/Score Equivalents:

<table>
<thead>
<tr>
<th>POINTS</th>
<th>GRADE</th>
<th>POINTS PER SEMESTER HOUR</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A</td>
<td>4</td>
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<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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<tr>
<td>60-69</td>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>0-59</td>
<td>F</td>
<td>0</td>
</tr>
<tr>
<td>WITHDRAWAL</td>
<td>W</td>
<td>0</td>
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<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 semesters. The deadline for sessions of other lengths is:

<table>
<thead>
<tr>
<th>Session Length</th>
<th>Deadline</th>
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<tbody>
<tr>
<td>10-week session</td>
<td>Friday of the 8th week</td>
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<tr>
<td>8-week session</td>
<td>Friday of the 6th week</td>
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<tr>
<td>5-week session</td>
<td>Friday of the 4th week</td>
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</table>

The equivalent date (75% of the semester) will be used for sessions 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 (“IP”) may be given in those cases where the student has completed the majority of the coursework 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 “IP” 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](http://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 in 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: Electrical Systems**

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

   a. Identify mechanical or electrical systems subject to damage from a collision. (F9)
   b. Repair, replace, and/or service damaged mechanical or electrical systems. (C18, 19)
   c. Use appropriate test and welding equipment. (C18, 19)
   d. Use service publications. (F1)
   e. Practice shop safety and properly and safely use and maintain tools and equipment. (F9) (C20)
   f. Explain and use basic electrical and electronic theories. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)
   g. Locate and identify automotive electrical and electronic circuits and components and use electrical test equipment to test circuits and components. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)
   h. Service batteries. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)
   i. Service lighting, accessory and body electrical systems. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)
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 discussions. (F5, F6, F7, F9, F10, C1, C5, C6, C7)
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. Electrical/Electronic Device Assortment
b. Electrical Circuits/Diagrams
c. Electrical Components
d. Vehicles with Operational Electrical Systems: door locks, power windows, power seats, SIRS, and lighting systems, etc.
e. Electrical Test Equipment
f. Mechanics Tool Kit
g. Batteries
h. Battery Service Tools and Equipment
i. Service Publications
j. TV/VCR (as required)
k. 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. Safety
c. Electrical Theory
d. Electronic Theory
e. Circuits
f. Electrical Diagrams
g. Service Publications
h. Test Equipment
i. System Testing and Repair
j. Soldering
k. Wire Repair
l. Batteries
m. Battery Service
   (1) Operation
   (2) Service and Repair
n. Accessory Systems
   (1) Operation
   (2) Service and Repair
o. Body Electrical System
   (1) Operation
   (2) Service and Repair

B. Lesson Two: Fuel and Emission System

1. Learning Outcomes: Upon successful completion of this lesson the student will:
   a. Identify mechanical or electrical systems subject to damage from a collision. (F9)
   b. Repair, replace, and/or service damaged mechanical or electrical systems. (C18, 19)
   c. Use appropriate test and welding equipment. (C18, 19)
   d. Use service publications. (F1)
   e. Practice shop safety and properly and safely use and maintain tools and equipment. (F9) (C20)
   f. Service fuel and emission systems. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)
   g. Service exhaust systems. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

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 discussions. (F5, F6, F7, F9, F10, C1, C5, C6, C7)
   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. Electrical/Electronic Device Assortment
   b. Electrical Circuits/Diagrams
   c. Electrical Components
   d. Vehicles with Operational Electrical Systems: door locks, power windows, power seats, SIRS, and lighting systems, etc.
   e. Electrical Test Equipment
   f. Mechanics Tool Kit
   g. Batteries
   h. Battery Service Tools and Equipment
   i. Service Publications
   j. Fuel System Test Equipment
   k. TV/VCR (as required)
   l. 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. Safety
   c. Fuel Systems
   d. Exhaust Systems
   e. Service Publications
   f. Service and Repair

C. **Lesson Three:** Cooling Systems

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

   a. Identify mechanical or electrical systems subject to damage from a collision. (F9)
   b. Repair, replace, and/or service damaged mechanical or electrical systems. (C18, 19)
   c. Use appropriate test and welding equipment. (C18, 19)
   d. Use service publications. (F1)
   e. Practice shop safety and properly and safely use and maintain tools and equipment. (F9) (C20)
f. Service cooling systems. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

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 discussions. (F5, F6, F7, F9, F10, C1, C5, C6, C7)
   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. Electrical/Electronic Device Assortment
   b. Electrical Circuits/Diagrams
   c. Electrical Components
   d. Vehicles with Operational Electrical Systems: door locks, power windows, power seats, SIRS, and lighting systems, etc.
   e. Electrical Test Equipment
   f. Mechanics Tool Kit
   g. Batteries
   h. Battery Service Tools and Equipment
   i. Service Publications
   j. Vehicle Cooling System
   k. Cooling System Test Equipment
   l. Antifreeze
   m. TV/VCR (as required)
   n. 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. Safety

c. Cooling Systems
   (1) Theory and Operation
   (2) Testing
   (3) Servicing

D. Lesson Four: Drive Trains

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

   a. Identify mechanical or electrical systems subject to damage from a collision. (F9)
   b. Repair, replace, and/or service damaged mechanical or electrical systems. (C18, 19)
   c. Use appropriate test and welding equipment. (C18, 19)
   d. Use service publications. (F1)
   e. Practice shop safety and properly and safely use and maintain tools and equipment. (F9) (C20)
   f. Improves or designs systems. (C17)
   g. Service drive trains. (C5, 6, 7, 15, 16, 18, 19, 20) (F1, 2, 3, 9, 12)

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 discussions. (F5, F6, F7, F9, F10, C1, C5, C6, C7)
   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. Electrical/Electronic Device Assortment
   b. Electrical Circuits/Diagrams
   c. Electrical Components
   d. Vehicles with Operational Electrical Systems: door locks, power windows, power seats, SIRS, and lighting systems, etc.
   e. Electrical Test Equipment
f. Mechanics Tool Kit  
g. Batteries  
h. Battery Service Tools and Equipment  
i. Service Publications  
j. Standard Power Train  
k. Automatic Power Train  
l. Special Tools (as required)  
m. Jack  
n. Jack Stands or Lift  
o. TV/VCR (as required)  
p. 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. Safety  
c. Power Train Operation  
d. Power Train Removal  
e. Power Train Installation  
f. Service Checks
Learning Outcome: Systems (Improve Designs)

This is a written assignment. It may be handwritten, typed, or done on a computer. If handwritten, writing must be legible. This task must be completed prior to taking your final/exit exam for this course.

Select an area or task in this course that you feel should be changed to improve the course. Write a paper at least three pages in length that fully explains the change that you feel should be made. The paper must include:

a. State the current procedure or task.

b. State the change that you feel should be made.

c. List any additional equipment and/or materials needed to accomplish the change.

d. Prepare an estimated cost list for the equipment and/or materials needed based on 20 students in the class.

e. Justify the change.

See your instructor if you have any questions.

Turn the assignment into your instructor and discuss it with him. Be prepared to defend your justification.
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 ("P", "N" or a numeric grade) 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 3.7 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, absence, or unsafe act will result in a deduction of points from your total lab score. Points will NOT be awarded for Enabling Tasks.

<table>
<thead>
<tr>
<th>TASK</th>
<th>LEARNING ACTIVITY DESCRIPTION</th>
<th>DATE</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Write a 4 page paper explaining the basic theory of electricity/electronics. You must address the following topics:</td>
<td></td>
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<tr>
<td></td>
<td>a. Atomic structure</td>
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<td></td>
<td>b. Volts, ohms, amps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Ohm's law</td>
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<tr>
<td></td>
<td>d. Electromagnetism</td>
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<tr>
<td></td>
<td>e. Semiconductors and solid-state electronics</td>
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<tr>
<td>2.</td>
<td>Using circuit boards supplied by your instructor, construct the three basic automotive circuits.</td>
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<tr>
<td>3.</td>
<td>Identify electrical/electronic devices selected by the instructor and explain their use and operation. (A minimum of five (5) items must be identified.)</td>
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<tr>
<td>4.</td>
<td>Make electrical wiring repairs selected by the instructor. This task includes:</td>
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<tr>
<td></td>
<td>a. Splicing repairs</td>
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<td>b. Solder repairs</td>
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<td></td>
<td>c. Repairs using solderless connectors</td>
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<tr>
<td></td>
<td>d. Shrink tubing</td>
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</tbody>
</table>
5. Use a wiring diagram furnished by the instructor. This task includes:
   a. Tracing circuits (at least 3)
   b. Identifying components (at least 4)
   c. Identifying symbols (at least 6)

6. Use electric test devices and equipment as directed by the instructor. This includes the use of:
   a. Jumper wires
   b. Test lights (self powered and non-powered): Check continuity, presence of voltage.
   c. Digital Volt/Ohm Meters (DVOMs):
      1. measure circuit voltage, current, and resistance.
      2. measure voltage drop and current draw.
   d. Select the correct items of test equipment and test the function and/or serviceability of components selected by the instructor.

7. Service a battery and vehicle selected by the instructor. This task includes:
   a. Battery testing (in-car and out-of-car)
   b. Clean battery
   c. Remove and install a battery
   d. Do a specific gravity test
   e. Measure cell voltage
   f. Do an alternate battery load test (record finding)
   g. Do a battery parasitic drain test (record finding)
   h. Demonstrate proper jumper cable hookup

8. Service the lighting system on a vehicle selected by the instructor. This task includes:
   a. Remove and install a headlight and tail light
   b. Aim headlights
   c. Troubleshoot a lighting problem
   d. Repair a lighting problem

9. Service automotive accessory electrical problems on a vehicle selected by the instructor. This task includes the following as a minimum (The instructor may add additional items):
   a. Troubleshoot and repair a horn problem
   b. Troubleshoot and repair a wiper problem
   c. Troubleshoot and repair an instrument problem (electronic and electromagnetic)
10. Service automotive body electrical systems on a vehicle selected by the instructor. This task includes the following as a minimum (The instructor may add additional items):
   a. Power door locks
   b. Power windows
   c. Power seats

   a. Identify and describe the operation of the basic components of an air bag system.
   b. Demonstrate the procedure for DISARMING an airbag system.
   c. Describe the procedure to follow and the safety precautions to be observed when and air bag has to be DEPLOYED.

12. Locate and identify the components of the fuel system on a vehicle selected by your instructor.

13. Properly use tools and test equipment to inspect, test, and service the fuel system on a vehicle with:
   a. a mechanical fuel pump.
   b. an electric fuel pump.
   c. and electrically switched, two-tank system.

14. Remove and disassemble a fuel tank, test the operation of the fuel gage sending unit, then reassemble and reinstall the tank.

15. Use proper tools and equipment to separate and repair fuel lines. This task includes forming:
   a. a single flare.
   b. a double flare.
   c. an ISO flare. (metric)
   d. tubing bends.

16. Locate, identify, and describe the basic function of each of the components of the emission system of a vehicle selected by your instructor.

17. Remove, test, and replace an oxygen sensor.

18. Remove, inspect, test, and replace a vapor canister.

19. Locate, identify, and describe the function of the exhaust system components of a vehicle selected by your instructor.

20. Perform and exhaust system inspection and test on a vehicle designated by your instructor. Note your findings and a probable repair plan.

21. Properly use tools and equipment to disassemble the exhaust system of a vehicle designated by your instructor.
22. Locate and identify the components of a mechanically and an electronically controlled cooling system on vehicles selected by your instructor.

23. Properly use tools and test equipment and inspect, test and service the cooling systems on vehicles selected by your instructor. This task includes the following:
   a. Perform visual inspections of the cooling system. (all faults or worn parts or components should be annotated)
   b. Remove and replace a radiator.
   c. Perform minor radiator repairs and pressure checks.
   d. Remove and replace a water pump and thermostat.
   e. Remove and replace a fan and fan clutch.

24. Describe the safety precautions to follow during drive train removal and replacement.

25. Identify the disconnects to be made during the drive train removal on your assigned vehicle.

26. Remove a front-wheel drive train as an assembly from your assigned vehicle, replace components as directed by your instructor, reinstall the drive train, and test for full operation and function.

27. Practice shop safety and properly and safely use and maintain tools and equipment. This task will be evaluated throughout the course.

28. Improve or design new system. Complete Worksheet 2402-01.

<table>
<thead>
<tr>
<th>Total Points/Grade Awarded (Possible 100 Points)</th>
<th></th>
</tr>
</thead>
</table>
**CENTRAL TEXAS COLLEGE**  
**COMPETENCY PROFILE**

<table>
<thead>
<tr>
<th>Program:</th>
<th>Auto Collision Repair Technician</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course:</td>
<td>ABDR 2402 Auto Body Electrical and Mechanical Service 144 clock hours 4 credits</td>
</tr>
<tr>
<td>Entry Occupation:</td>
<td>Auto Body Repair Apprentice/Helper</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. (Enter N/A if the item is not applicable or not observed.) 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.
| Learning Outcome 1: | The student will identify mechanical or electrical systems subject to damage from a collision. (F9) |
| Learning Outcome 2: | Repair, replace, and/or service damaged mechanical or electrical systems. (C18, 19) |
| Learning Outcome 3: | Use appropriate test and welding equipment. (C18, 19) |
| Learning Outcome 4: | Use service publications. (F1) |
| Learning Outcome 5: | Practice shop safety and properly and safely use and maintain tools and equipment. (F9)(C20) |
| Learning Outcome 6: | Improves or designs systems. (C17) |
| Learning Outcome 7: | Explain and use basic electrical and electronic theories. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 2, 3, 9, 12) |
| Learning Outcome 8: | Locate and identify automotive electrical and electronic circuits and components and use electrical test equipment to test circuits and components. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 2, 3, 9, 12) |
| Learning Outcome 9: | Service batteries. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 2, 3, 9, 12) |
| Learning Outcome 10: | Service cooling systems. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 2, 3, 9, 12) |
| Learning Outcome 11: | Service drive trains. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 2, 3, 9, 12) |
| Learning Outcome 12: | Service lighting, accessory and body electrical systems. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 2, 3, 9, 12) |
| Learning Outcome 13: | Service fuel and emission systems. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 2, 3, 9, 12) |
| Learning Outcome 14: | Service exhaust systems. (C5, 6, 7, 15, 16, 18, 19, 20)(F1, 2, 3, 9, 12) |
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>
<td></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>
<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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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>N/A</th>
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</table>

### Work Attitudes
- willingness to learn; willingness to accept and profit from evaluation; enthusiasm; initiative; commitment; pride in work

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

### Communication
- listening; speaking; and nonverbal skills; effectiveness in communicating with staff and other workers.

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<th>3</th>
<th>N/A</th>
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</thead>
</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>
</tr>
</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 completing additional external learning experience.
- **Entry level** skills after completing additional course work.
- **Entry level** skills after completing 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 ______________________

<table>
<thead>
<tr>
<th>Written Exam</th>
<th>First</th>
<th>Second</th>
<th>Exit</th>
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</thead>
<tbody>
<tr>
<td>Final Score</td>
<td></td>
<td></td>
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