Heavy Equipment Suspension, Steering and Brake Systems
Course Design
2006-2007

Course Information
Organization: Eastern Arizona College
Division: Industrial Technology Education
Course Number: AUT 135
Title: Heavy Equipment Suspension, Steering and Brake Systems
Credits: 3
Developed by: Brian Coppola
Lecture/Lab Ratio: 2 Lecture/3 Lab
Transfer Status: Non-transferable
Activity Course: No
CIP Code: 47.0605
Assessment Mode: Pre/Post Test (25 Questions/100 Points)
Semester Taught: Fall
GE Category: None
Separate Lab: No
Awareness Course: No
Intensive Writing Course: No

Prerequisites
None

Educational Value
This course is designed to reinforce and apply information, processes, and ideas gained in other courses. The major intent of this course is to enhance the individual's abilities to work with and diagnosis vehicle steering and suspension systems.

Goals
It is the intent of this course to prepare the student to work as a diesel heavy equipment service technician capable of satisfactorily servicing steering, and brake systems.
**Description**

This course provides the theory, diagnosis and the repair of heavy equipment suspension, steering and brake systems. This in-depth study includes tires and wheels, steering components, suspension types, and hydraulic & air brake systems. This course covers diagnostic and service techniques of suspension, steering and braking systems.

**Textbooks**


**Competencies and Performance Standards**

1. **Apply proper safety procedures and processes.**

   **Learning objectives**

   *What you will learn as you master the competency:*

   a. Acquaint self with shop environment and hazards.
   b. Acquaint self with emergency procedures and policy.
   c. Accept responsibility for personal well being and practice and follow safety guidelines.
   d. Acquaint self with material safety data sheets and chemical used in shop.

   **Performance Standards**

   *Competence will be demonstrated:*

   o when learner completes safety assignments and written exam at a satisfactory level.

   **Criteria - Performance will be satisfactory when:**

   o learner observes and practices safety procedures.

2. **Diagnose and repair various steering system concerns using a strategy-based process.**

   **Learning objectives**

   *What you will learn as you master the competency:*

   a. Determine root cause for steering systems' problems related to steering columns, linkages, gearbox, rack, power steering components and electronically controlled systems.
   b. Perform needed repairs to solve steering systems' problems related to steering columns, linkages, gearbox, rack, power steering components and electronically controlled systems.

   **Performance Standards**

   *Competence will be demonstrated:*

   o When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor).
   o When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level).
Criteria - Performance will be satisfactory when:

- learner is productive, works safely, and in a professional manner while working on task requirements listed in related learning plan.
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.
- learner actively participates in the task requirements listed in the related learning plan.
- learner attends required class and lab sessions and shows up on time.

3. **Diagnose and repair various front suspension system concerns using a strategy-based process.**

**Learning objectives**

*What you will learn as you master the competency:*

- **a.** Determine root cause for front suspension problems related to ride height, body sway, SLA & solid axle components, linkages, knuckle assemblies, ball joints, and bearing plated assemblies.
- **b.** Perform needed repairs to solve front system problems related to ride height, body sway, suspension components, linkages, knuckle assemblies, ball joints, and bearing plated assemblies.

**Performance Standards**

*Competence will be demonstrated:*

- When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor).
- When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level).

Criteria - Performance will be satisfactory when:

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- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.
- learner actively participates in the task requirements listed in the related learning plan.
- learner attends required class and lab sessions and shows up on time.

4. **Diagnose and repair various wheel and tire concerns.**

**Learning objectives**

*What you will learn as you master the competency:*

- **a.** Determine root cause of unusual tire problems related to wear patterns, vibration, shimmy, noise and vehicle pull.
- **b.** Perform needed repairs to solve tire related problems.
c. Perform proper preventative service on tire and wheel components.

**Performance Standards**

*Competence will be demonstrated:*

- When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor).
- When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level).

*Criteria - Performance will be satisfactory when:*

- Learner is productive, works safely, and in a professional manner while working on NATEF task requirements listed in related learning plan.
- Learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.
- Learner actively participates in the task requirements listed in the related learning plan.
- Learner attends required class and lab sessions and shows up on time.

5. **Perform hydraulic brake system component replacement and/or repairs needed to bring hydraulic system back to proper operating order.**

**Learning objectives**

*What you will learn as you master the competency:*

- Perform repair on master cylinder, lines, switches valving, calipers and wheel cylinders.
- Perform preventative brake flush procedure to maintain hydraulic system in good working order.

**Performance Standards**

*Competence will be demonstrated:*

- When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor.)
- When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level.)

*Criteria - Performance will be satisfactory when:*

- Learner is productive, works safely, and in a professional manner while working on task requirements listed in related learning plan.
- Learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.
- Learner actively participates in the task requirements listed in the related learning plan.
- Learner attends required class and lab sessions and shows up on time.

6. **Diagnose disc / drum brake operational concerns.**

**Learning objectives**
What you will learn as you master the competency:

a. Determine root cause of disc / drum brake system operational failure.
b. Inspect disc / drum brake system to prevent drum brake failure.

**Performance Standards**

**Competence will be demonstrated:**

- When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor.)
- When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level.)

**Criteria - Performance will be satisfactory when:**

- learner is productive, works safely, and in a professional manner while working on task requirements listed in related learning plan.
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.
- learner actively participates in the task requirements listed in the related learning plan.
- learner attends required class and lab sessions and shows up on time.

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7. Perform disc / drum brake system component repairs and/or replacement to bring brake system back to proper operating order.

**Learning objectives**

What you will learn as you master the competency:

a. Perform disc / drum brake inspection, clean, adjustments, turn drums, and fluid bleeding to bring disc / drum brake system back to proper operation.

**Performance Standards**

**Competence will be demonstrated:**

- When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor.)
- When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level.)

**Criteria - Performance will be satisfactory when:**

- learner is productive, works safely, and in a professional manner while working on task requirements listed in related learning plan.
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.
- learner actively participates in the task requirements listed in the related learning plan.
- learner attends required class and lab sessions and shows up on time.

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8. Diagnose air brake operational concerns.
**Learning objectives**

*What you will learn as you master the competency:*

a. Determine root cause of air brake systems operational concern.
b. Inspect air brake system to prevent disc brake failure.

**Performance Standards**

*Competence will be demonstrated:*

- When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor.)
- When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level.)

*Criteria - Performance will be satisfactory when:*

- learner is productive, works safely, and in a professional manner while working on task requirements listed in related learning plan.
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.
- learner actively participates in the task requirements listed in the related learning plan.
- learner attends required class and lab sessions and shows up on time.

9. **Perform air brake system component repair and/or replacement to bring brake system back to proper operating order.**

**Learning objectives**

*What you will learn as you master the competency:*

a. Perform air brake inspection, clean, component replacement/repair, turn rotors, adjustments, and fluid bleeding to bring disc brake system back to proper operation.

**Performance Standards**

*Competence will be demonstrated:*

- When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor.)
- When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level.)

*Criteria - Performance will be satisfactory when:*

- learner is productive, works safely, and in a professional manner while working on task requirements listed in related learning plan.
- learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.
- learner actively participates in the task requirements listed in the related learning plan.
- learner attends required class and lab sessions and shows up on time.
10. **Diagnose brake system’s power assist system for operational concerns.**

   **Learning objectives**
   
   *What you will learn as you master the competency:*
   
a. Determine brake power assists systems operation failure.

   **Performance Standards**
   
   *Competence will be demonstrated:*
   
o When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor.)

   o When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level.)

   **Criteria - Performance will be satisfactory when:*
   
o learner is productive, works safely, and in a professional manner while working on task requirements listed in related learning plan.

   o learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.

   o learner actively participates in the task requirements listed in the related learning plan.

   o learner attends required class and lab sessions and shows up on time.

11. **Perform brake power assist component repair and/or replacement to bring brake assist system back to proper operating order.**

   **Learning objectives**
   
   *What you will learn as you master the competency:*
   
a. Perform testing and inspection process to isolate power assist failure.

   b. Replace powers assist failed component.

   **Performance Standards**
   
   *Competence will be demonstrated:*
   
o When learner completes aligned assignment and job sheets listed in the related learning plan. (The assignment and job sheets must be completed at a satisfactory level to the instructor.)

   o When the learner performs the priority tasks listed in the related learning plan. (The tasks must be completed with limited supervision - entry level.)

   **Criteria - Performance will be satisfactory when:*
   
o learner is productive, works safely, and in a professional manner while working on task requirements listed in related learning plan.

   o learner provides acceptable oral and/or written responses to questions and/or situations asked by the instructor, while working on the task requirements listed in related learning plan.

   o learner actively participates in the task requirements listed in the related learning plan.

   o learner attends required class and lab sessions and shows up on time.
**Types of Instruction**

Classroom Presentation  
Lab  
Computer-based instruction  
Simulated or Actual Work Experience  
Individualized Self Study

**Grading Information**

**Grading Rationale**

Grading Weights

Lab=45%  
Class (Includes Test and Assignments)=45%  
Final Exam (Post Test is the Final)=10%

Note: The Pre/Post test has a total of 25 questions which are worth "4" points each. total possible on the AUT 107 Pre/Post test is 100 points. However, the district requires the instructor to record number of questions correct as the raw score with maximum = 25 points.

Grading Methods

Class score calculation-  
Quizzes, assignments and job sheet points shall be added and carry a weight equal to one test score.  
All exams except the final shall have equal weight (test scores averaged) and used in class score calculations.  
The final (post test) will be worth at least 10% of the overall final grade calculation.

Lab score calculation-  
Instructor should evaluate each student's work habits using lab time card.  
Each student should be evaluated on productivity and progress on task requirements, working in a professional manner, clean-up and safe work habits. Instructor is also required to evaluate each student's skill level in achieving the NATEF task requirement outlined in the various learning plans.

Instructors are encouraged to reward students for showing up on time and attending each class and lab session. This can be done by requiring students to make arrangements with the instructor to make-up any lost time prior to missed day. All students need to notify the instructor of sick days through voice mail, etc. on the day of sickness. Instructors should not allow for any work to be turned in late or any test made up without some type of deduction for late assignments/test. Suggested deduction 50% of original score.
**Grading Scale**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100%</td>
</tr>
<tr>
<td>B</td>
<td>80-89.9%</td>
</tr>
<tr>
<td>C</td>
<td>70-79.9%</td>
</tr>
<tr>
<td>D</td>
<td>60-69.9%</td>
</tr>
<tr>
<td>F</td>
<td>0-59.9%</td>
</tr>
</tbody>
</table>

**Pass/Fail**

A non-major student may choose to have a grade of P or F rather than a letter grade. A grade of P will require that the student receive a percentage grade of at least 68%. A grade less than this will result in a grade of F.