Machine Hydraulics
Course Design
2006-2007

Course Information
Organization: Eastern Arizona College
Division: Industrial Technology Education
Course Number: AUT 117
Title: Machine Hydraulics
Credits: 2
Developed by: Brian Coppola
Lecture/Lab Ratio: 1 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: Spring
GE Category: None
Separate Lab: No
Awareness Course: No
Intensive Writing Course: No

Prerequisites
TEC 112 or instructor approval

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 the diesel and industrial plant equipment.

Description
Provides instruction in operational theory and testing techniques related to hydraulic components and circuits on mobile diesel equipment. Includes an opportunity for the individual to apply fluid power principles and investigate the functional characteristic of hydraulic pumps, flow valves, pressure valves, directional valves, motors, cylinders and accumulators. Emphasis is placed on the student's ability to test, service, and repair diesel equipment hydraulic systems and system components.
Textbooks
Caterpillar, INC. *Machine Specific Service Manuals / SIS - Software*. Provided in classroom

Supplies
safety glasses, steel toe shoes, and shop clothes (cotton)

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 safety procedures and processes.

2. Demonstrate an ability to remove, reinstall, disassemble and reassemble machine specific hydraulic components (valves, pumps, and cylinders)

   **Learning objectives**
   
   What you will learn as you master the competency:
   
   a. Perform hydraulic component removal and reinstallation.
   b. Perform disassemble, inspection, and reassemble procedure on hydraulic cylinder, pump, flow valve, pressure valve, directional valve.

   **Performance Standards**
   
   You will demonstrate your competence:
   
   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.)

   **Your performance will be successful 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.
3. Acquire operation knowledge of basic machine specific hydraulic circuits / systems and their functional characteristics.

**Learning objectives**

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

a. Develop an understanding of the operational features and functions of machine specific hydraulic circuits.

**Performance Standards**

*You will demonstrate your competence:*

- 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.)

*Your performance will be successful when:*

- 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. Acquire operational knowledge related to machine specific hydraulic components (pumps, motors, valves, cylinders, accumulators) and their functional characteristics.

**Learning objectives**

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

a. Develop fundamental understanding of how "collectively" hydraulic pumps, valves, motors, accumulators, cylinders, and the fluid function to operate the machine's hydraulic system.

b. Acquire an understanding of which hydraulic components are utilized in various mobile equipment.

**Performance Standards**

*You will demonstrate your competence:*

- 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.)

*Your performance will be successful when:*

- 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.
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.

5. **Perform machine specific maintenance processes and obtain oil sample on hydraulic system.**

   **Learning objectives**
   
   *What you will learn as you master the competency:*
   
   a. Analyze oil sample information to determine condition of various hydraulic circuits.
   
   b. Obtain oil sample from hydraulic system.
   
   c. Perform proper maintenance procedures that will ensure hydraulic systems operate as designed

   **Performance Standards**
   
   *You will demonstrate your competence:*
   
   - 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.)

   *Your performance will be successful 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. **Demonstrate the ability to use service and repair information to perform needed maintenance, service, testing, and repairs.**

   **Learning objectives**
   
   *What you will learn as you master the competency:*
   
   a. Demonstrate an ability to find and apply service and repair information (paper or computerized manual) to perform assigned lab activities.

   **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.

**7. Demonstrate an ability to interpret and apply knowledge related to hydraulic graphic symbols.**

**Learning objectives**

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

a. Identify "on equipment" hydraulic component type using graphic symbol
b. Describe operational features of hydraulic components and circuits using hydraulic graphic symbols and diagrams.

**Performance Standards**

*You will demonstrate your competence:*

- 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.)

*Your performance will be successful 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.

**8. Demonstrate an ability to assemble, operate, and test (pressure and or flow) various machine hydraulic circuits that includes pumps, motors, valves, cylinders, and accumulators.**

**Learning objectives**

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

a. Install various hydraulic components on diesel equipment, bleed or adjust system as needed.
b. Perform hydraulic pressure and or flow testing procedures as outlined in the equipment service manual.

**Performance Standards**

*You will demonstrate your competence:*

- 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.)

*Your performance will be successful 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.

**Types of Instruction**

Classroom Presentation
Lab
Individualized/Independent Study
Simulated or Actual Work Experience

**Grading Information**

**Grading Rationale**

Grading Weights

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

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.