

**SAN DIEGO COMMUNITY COLLEGE DISTRICT  
MIRAMAR COLLEGE  
ASSOCIATE DEGREE COURSE OUTLINE**

**SECTION I****SUBJECT AREA AND COURSE NUMBER:** Diesel Technology 245**COURSE TITLE:** Power Trains D (HET)**Units: 6**  
Grade Only**CATALOG COURSE DESCRIPTION:**

Students learn about the operation and servicing of mobile hydraulic systems and components including reservoirs, pumps, actuators, valves, piping, and fittings. They also learn how to use common recommended shop procedures, hydraulic schematics, and test equipment for diagnosis, failure analysis, and system and component repair. Topics include how to operate and service heavy equipment hydraulic transmissions including power-shift transmissions.

**REQUISITES:**

**Corequisite: Completion of or concurrent enrollment in:**  
DIES 100 with a grade of "C" or better, or equivalent

**Limitation on Enrollment:**

This course is not open to students with previous credit for DIES 200 or 230

**FIELD TRIP REQUIREMENTS:** May be required**TRANSFER APPLICABILITY:** Associate Degree Credit & transfer to CSU and/or private colleges and universities**TOTAL LECTURE HOURS:** 64 - 72**TOTAL LAB HOURS:** 96 - 108**STUDENT LEARNING OBJECTIVES:**

Upon successful completion of the course the student will be able to:

1. Identify special hazards of working with heavy equipment and hydraulic systems that use powershift transmissions
2. Select the proper special tools for handling and working on hydraulic systems and powershift transmissions
3. Use schematics and diagrams to analyze basic hydraulic systems
4. Perform common service procedures on hydraulic system components
5. Describe the types and applications of hydraulic valves
6. Compare and contrast the major types of reservoirs
7. Select the appropriate fluid, filter, and screens for servicing hydraulic systems using Original Equipment Manufacturer (OEM) service information
8. Describe the principles and system requirements for a hydraulic system
9. Identify and select the appropriate application of common fittings
10. Describe the theory, construction, and common applications of torque converters, fluid couplings,

and powershift transmissions

11. Perform service procedures on torque converters, fluid couplings, and powershift transmissions using appropriate service data

12. Identify and analyze problems and failures in torque converters, fluid couplings, and powershift transmissions.

## **SECTION II**

### **1. COURSE OUTLINE AND SCOPE:**

#### **A. Outline Of Topics:**

The following topics are included in the framework of the course but are not intended as limits on content. The order of presentation and relative emphasis will vary with each instructor.

- I. Course overview
  - A. Course content
  - B. Grading system
  - C. Safe working procedures
  - D. Project organization
  - E. Handling components
  - F. Special tools.
- II. Fundamentals of hydraulics
  - A. Identification and application of fittings
  - B. Principles of fluid power
    - 1. Terms and theory
    - 2. System requirements.
- III. Fluids, reservoirs, screens, and filters
  - A. Fluids
  - B. Reservoirs
    - 1. Un-pressurized
    - 2. Pressurized.
  - C. Screens and filters
  - D. Problem diagnosis and service.
- IV. Lines, construction, and service
  - A. Classification of lines
  - B. Selection and construction of hydraulic lines
  - C. Problem diagnosis and service.
- V. Control and relief valves
  - A. Basic valve types
  - B. Load sensing pressure compensating valves
  - C. Selection and adjustment of valves
  - D. Problem diagnosis and service.
- VI. Linear actuators and hydraulic motors
  - A. Single and double acting linear actuators
  - B. Rotary actuators (motors)
  - C. Problem diagnosis and service.
- VII. Basic systems
  - A. Simple lift (jacks and dump bodies)
  - B. Power steering (truck and equipment)
  - C. Multi-function systems
  - D. Problem diagnosis and service.
- VIII. Torque converters and fluid couplings
  - A. Operational theory and construction
  - B. Overhaul procedures
  - C. On-vehicle troubleshooting and failure analysis.
- IX. Powershift transmissions
  - A. Application and theory of operation
  - B. Overhaul procedures
  - C. Problem diagnosis.

**B. Reading Assignments:**

Reading assignments are required and may include but, are not limited to, the following:

- I. 1. Chapters from course textbook(s)
- II. 2. Articles related to diesel repair in professional journals such as Service Tech, Diesel Progress, Commercial Carrier Journal (CCJ), Utility Fleet, Fleet Owner, and Transportation Equipment News
- III. 3. Reports, repair manuals, on-line resources, and laboratory guides associated with diesel technology.

**C. Appropriate Assignments that Demonstrate Critical Thinking:**

Critical thinking assignments are required and may include, but are not limited to, the following:

- I. 1. Analyzing methods learned in class and utilizing appropriate methods for completing laboratory tasks
- II. 2. Evaluating and recording the condition of major hydraulic system components
- III. 3. Formulating repair plans for major hydraulic transmission components
- IV. 4. Calculating and solving mathematical problems.

**D. Appropriate Outside Assignments:**

Outside assignments may include, but are not limited to, the following:

- I. 1. Conducting research related to updates on hydraulic systems and transmissions at Caterpillar websites
- II. 2. Completing all reading and writing assignments, including a shop notebook and a dozer hydraulic system operation report
- III. 3. Completing a field assignment report on a site visit to a local heavy equipment repair shop.

**E. Writing Assignments:**

Writing assignments are required and may include, but are not limited to, the following:

- I. 1. Preparing a shop notebook
- II. 2. Writing a power flow report for a powershift transmission
- III. 3. Responding to short essay questions about related topics such as the operation and servicing of mobile hydraulic systems and heavy equipment hydraulic transmissions.

**2. METHODS OF EVALUATION:**

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

- I. Performing manipulative skills as needed to complete laboratory assignments satisfactorily
- Successfully applying theory to laboratory assignments
- Performing on written, oral, and/or practical examinations
- Performing on out-of-class assignments including diesel engine reports and projects
- Contributing to class discussion
- Maintaining attendance per current department policy.

**3. METHODS OF INSTRUCTION:**

Methods of instruction may include, but are not limited to, the following:

- \* Lecture
- \* Laboratory
- \* Lecture-Lab Combination
- \* Other (Specify)
- \* A. Demonstration
- \* B. Field trips and/or field assignments
- \* C. Computer-assisted instruction.

#### **4. REQUIRED TEXTS AND SUPPLIES:**

Textbooks may include, but are not limited to:

##### **TEXTBOOKS:**

1. Caterpillar, Inc.. SIS DVDA0005-29, Machines, 1st ed. Caterpillar, Inc., 2001,
2. Caterpillar, Inc.. SIS DVDA0004-29, Machines, 1st ed. Caterpillar, Inc., 2001,
3. Deere & Company. Hydraulic Systems Diagnostics, 1st ed. John Deere Publishing, 1999, ISBN: 0866912495
4. Deere & Company. Hydraulics, 6th ed. John Deere Publishing, 1999, ISBN: 0866912657
5. Lewis, Jim.. DIES-M Daily Reports, 2nd ed. Miramar Reprographics, 1982,

##### **MANUALS:**

##### **PERIODICALS:**

##### **SOFTWARE:**

##### **SUPPLIES:**

1. Safety glasses
2. Hearing protection
3. Calculator
4. Appropriate clothing and footwear for shop work
5. Scantron answer sheets

**ORIGINATOR:** Jim Lewis

**ORIGINATION DATE:** 08/28/1994

**PROPOSAL ORIGINATOR:** James Cargill

**CO-CONTRIBUTOR(S)**

**PROPOSAL DATE:** 03/05/2003