

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

**SECTION I****SUBJECT AREA AND COURSE NUMBER:** Diesel Technology 235**COURSE TITLE:** Power Trains C (HET)**Units: 6**  
Grade Only**CATALOG COURSE DESCRIPTION:**

Students learn the principles of operation, installation, and troubleshooting of single and double disc clutches. They also learn how to overhaul, maintain, and troubleshoot main, auxiliary, and twin countershaft manual transmissions and air shift systems. Topics include how to use specialized and general shop equipment and hand tools for removing and replacing components in general shop repairs of heavy equipment units.

**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 160 or 240

**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. Remove and replace components in general shop repairs of heavy equipment transportation (HET) units by selecting and using appropriate tools and safety procedures
2. Identify the function of commonly used dynamic and static seals and demonstrate their proper use
3. Prepare and explain, both orally and in writing, a plan to remove and replace major components in an organized manner
4. Explain the selection and uses of common types of bearings used in components; select the proper methods for their installation and adjustment
5. Compare and select the appropriate lubes for common applications on on-highway vehicles
6. Demonstrate, both orally and in writing, familiarity with nomenclature and design features of common on-highway vehicles, including frames, cab, and body elements
7. Identify the common methods and attach-points of major frame, cab, and body components of on-highway vehicles
8. Demonstrate proper lifting and rigging procedures using wire rope, chain, and slings with appropriate

types of cranes and jacks

9. Compare and contrast common methods of supporting vehicles and their components for safe and organized removal and replacement (R&R) procedures
10. Reassemble, install, and adjust (post installation) a clutch assembly on a vehicle or power unit
11. Disassemble and perform failure analysis of a clutch assembly
12. Formulate a repair plan for a failed clutch unit
13. Explain the operation of heavy duty clutches of single and multiple disc types
14. Safely remove and replace air, electrical, and hydraulic components from a heavy duty vehicle
15. Remove and replace major components of the frame, cab, or drive system of on-highway vehicles
16. Explain the theory of operation of heavy duty manual transmissions
17. Compare and contrast types of transmissions and transmission applications
18. Demonstrate and describe the operation and assembly of common air shift systems used on heavy duty manual transmissions
19. Select and use the tooling to disassemble, repair, and reassemble heavy duty manual transmissions
20. Select and use the tooling to disassemble, repair, and reassemble heavy duty manual transmissions
21. Detect the need for and perform major overhaul operations on heavy duty manual transmissions
22. Evaluate and formulate a repair plan of a heavy duty manual transmission or its major components
23. Demonstrate the ability to prepare written reports of lab activities and procedures relating to heavy duty 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 and hardware
  - G. Bearings, lubrication, and seals.
- II. Heavy equipment
  - A. Nomenclature and design
  - B. Frames
  - C. Cab and body.
- III. Basic shop rigging and lifting
  - A. Blocking and supporting equipment
  - B. Wire rope, chain, and slings
  - C. Use of Mobil, Bridge, and other types of cranes
  - D. Safe lifting and jacking points.
- IV. Basic component R&R
  - A. Large components
    1. Major drive components
    2. Cab and frame.
  - B. Small components
    1. Air
    2. Electrical
    3. Hydraulic.
  - C. Clutches
    1. Theory of operation
    2. Types: single and multiple disc
    3. Disassembly and failure analysis
    4. Rebuilding
    5. Adjustments: internal and external

6. Problem diagnosis.

V. Manual transmissions

- A. Theory of operation
- B. Main units
- C. Auxiliary units
- D. Tandem units
- E. Twin countershaft types
- F. Air shift systems
- G. Disassembly and failure analysis
- H. Rebuilding
- I. Problem diagnosis.

**B. Appropriate Outside Assignments:**

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

- I. 1. Conducting research relating to updates for clutches, transmissions, and heavy equipment repairs at Spicer, Eaton, and Caterpillar websites
- II. 2. Completing all reading and writing assignments, including a shop notebook and a ripper assembly replacement task analysis report
- III. 3. Completing a field assignment report on a site visit to a local heavy duty truck and/or heavy equipment repair shop.

**C. 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 13-speed transmission power flow report
- III. 3. Responding to short essay questions about related topics such as operating and servicing clutches and manual transmissions and removing and replacing major heavy equipment units.

**D. 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.

**E. 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 serviceability of major units of heavy equipment
- III. 3. Formulating repair plans for major components of clutches and transmissions
- IV. 4. Calculating and solving mathematical problems.

**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. Brady, Robert N.. Heavy Duty Trucks & Power Train Systems & Services, 2nd ed. Prentice-Hall, 2000, ISBN: 0131814702
2. Caterpillar.. SIS DVDA0002-29, Machines, 1st ed. Caterpillar, Inc., 2001,
3. Eaton.. Eaton Fuller Transmission Manual RTO958LL/RT9509/RT 9513, 3rd ed. Eaton Inc., 2000,
4. Eaton.. Eaton Fuller S/M RT/0/X-11/14/15715 -11/14708LL, 3rd ed. Eaton Inc., 2000,
5. Eaton.. Eaton Fuller Transmission S/M RT01258LL/RT12509/ 12513, 3rd ed. Eaton Inc., 2000,
6. 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:** 08/31/1994

**PROPOSAL ORIGINATOR:** James Cargill

**CO-CONTRIBUTOR(S)**

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