

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

SECTION I

SUBJECT AREA AND COURSE NUMBER: Diesel Technology 135

COURSE TITLE: Applied Failure Analysis

Units: 3
Grade Only

CATALOG COURSE DESCRIPTION:

Students learn about the fundamental principles involved in failure analysis of heavy duty diesel engine components. They also learn problem solving based on basic metallurgy concepts, different types of metals, metal forming processes, analysis of fractures, and identification of component wear characteristics.

REQUISITES:

NONE

FIELD TRIP REQUIREMENTS: May be required

TRANSFER APPLICABILITY: Associate Degree Credit & transfer to CSU and/or private colleges and universities

TOTAL LECTURE HOURS: 48 - 54

TOTAL LAB HOURS:

STUDENT LEARNING OBJECTIVES:

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

1. Describe the purpose of applied failure analysis
2. Select necessary skills for effectively managing failed components
3. Differentiate basic metallurgical concepts
4. Differentiate among metal types
5. Describe and compare metal forming processes
6. Identify the most common types of component wear
7. Distinguish component fracture types
8. Describe how to conduct a visual inspection of components
9. Evaluate engine components using basic concepts of metallurgy, wear, and fractures.

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. Failure analysis overview
 - A. Purpose
 - B. Steps.
- II. Failure analysis management
 - A. Record keeping
 - B. Communication.
- III. Basic metallurgy
 - A. Refining
 - B. Metal structure.
- IV. Metal types
 - A. Identification
 - B. Cast iron
 - C. Steel.
- V. Metal forming
 - A. Identification
 - B. Heat treatment
 - C. Flaws.
- VI. Common types of wear
 - A. Roadsigns
 - B. Abrasive
 - C. Adhesive
 - D. Corrosive
 - E. Errosive
 - F. Cavitatiion
 - G. Contact stress fatigue
 - H. Fretting.
- VII. Common fracture types
 - A. Roadsigns
 - B. Fatigue
 - C. Ductile
 - D. Brittle.
- VIII. Visual examination
 - A. Cleaning
 - B. Inspection
 - C. Tools.
- IX. Application of basic principles to components
 - A. Threaded fasteners
 - B. Connecting rods
 - C. Crankshafts
 - D. Engine bearings
 - E. Pistons, rings, and liners
 - F. Engine valves
 - G. Turbochargers.

B. Writing Assignments:

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

- I. 1. Writing a failure analysis report on engine bearings
- II. 2. Writing a management information report for a crankshaft failure
- III. 3. Responding to short essay questions about related topics such as basic metallurgy and the principles of fractures and wear.

C. 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.

D. 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 failure analysis tasks
- II. 2. Evaluating and recording any unusual wear features on diesel engine components
- III. 3. Formulating a management information plan for a failed
- IV. diesel engine
- V. 4. Calculating and solving mathematical problems.

E. Appropriate Outside Assignments:

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

- I. 1. Conducting research
- II. 2. Completing all reading and writing assignments, including a failure analysis report and a management information report
- III. 3. Completing field assignments/projects.

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 on written, oral, and/or practical examinations
- Performing on out-of-class assignments including a job-site failure analysis report
- 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
- * Lecture Discussion
- * Computer Assisted Instruction
- * Discussion Seminar
- * Learning Modules
- * Audio-Visual
- * Collaborative Learning
- * Shadowing
- * Other (Specify)
- * A. Demonstration
- * B. Field trips and/or field assignments.

4. REQUIRED TEXTS AND SUPPLIES:

Textbooks may include, but are not limited to:

TEXTBOOKS:

1. Caterpillar, Inc.. Applied Failure Analysis, SEBV0550, 2nd ed. Caterpillar, Inc., 1999,
2. Moniz, B. J.. Metallurgy, 1st ed. American Technical Publishers, Inc., 1992, ISBN: 0826935060

MANUALS:

PERIODICALS:

SOFTWARE:

SUPPLIES:

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

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