

COURSE INFORMATION

MAG 31 – EQUIPMENT TECHNICIAN

**Spring 2010 – Code: 50322
Fuels & Machine Undercarriage**

Lab – Fuels & Undercarriage	T, Th 8:00-9:40	AGM 5 SHOP
Lecture – Diesel Engines	T, Th 10:00-11:50	AGR 2
Lab – Fuels & Undercarriage	T, Th 1:00-1:50	AGM 5 SHOP
Lecture – Undercarriage	T, Th 2:00-2:50	AGR 2

Instructors: Larry Dinis

Office: AGM 5

Office #: 638-3641, Ext. 3151

E-mail: larry.dinis@reedleycollege.edu

Office Hours:

Monday – Thursday

3:00-4:00

Friday

10:00-11:00

Tues- Thurs.

10:00 - 11:00

Ben Drake

Office: AGM 5

Office #: 906-1217

E-mail:

Course Description 8 Units 4 lecture and 4 lab hours per week
This course provides in-depth instruction in diesel engine fuel systems, tune-up and troubleshooting procedures of diesel engines. Additional instruction will cover differentials, final drives braking and steering systems, tracks, and machine undercarriage. Emphasis will be placed on fuel injection system calibration and adjustment, and the procedures used to test and adjust various undercarriage components. Students will also receive career preparation instruction.

Basic Skills Advisors: Eligibility for ENGL 125, ENGL 126, and MATH 101

Subject Prerequisites/Advisories: None

Required Text:

- A. Caterpillar 3-ring binder and related materials
- B. Book – Diesel Engines and Fuel Systems Repair

(By second class meeting).

Course Objectives – In the process of completing this course, students will:

- A. Identify the duties of a supervisor.
- B. Develop a resume/personal folder.
- C. Analyze, draw conclusions, and defend a position on a contemporary career issue.
- D. Demonstrate ability to adjust differentials by setting preload and backlash.
- E. Identify various components and explain operation of differential steering systems, steering clutches and braking systems.
- F. Demonstrate ability to safely remove and install tracks and belts on machine drive systems.
- G. Safely use hand and diagnostic tools related to diesel engine troubleshooting and tune-up.
- H. Properly use technical manuals and follow written directions.
- I. Determine procedures to tune-up and time various diesel engines using special equipment.
- J. Identify fuel injection system components.

Course Outcomes - The student who completes this course will be able to:

Upon completion of this course, students will be able to:

- A. Disassemble; make necessary repairs and replacement of parts using correct failure analysis procedures, and reassemble steering clutches and brakes

- B. Determine wear patterns and follow appropriate procedures for replacing worn or defective parts in machine undercarriage systems.
- C. Select and use problem solving (troubleshooting) techniques appropriate to undercarriage systems.
- D. Link theory to diesel engine operation by demonstrating ability to properly diagnosing various engine problems and performing appropriate adjustments and corrections.
- E. Transfer knowledge from lecture to perform tune-up of engines in a laboratory setting.
- F. Use inductive and deductive reasoning to troubleshoot and repair the complaint of black, white, and blue smoke.
- G. Discuss course content articulately with terminology appropriate to equipment repair technicians.
- H. Select and use problem solving techniques appropriate to repair faults in electronic controls of diesel engines.
- J. Complete applications, resumes, job training reports, and job plan reports.
- K. Demonstrate skill in job preparation by taking part in mock interviews.

Course Outline

- A. Career Preparation
 - 1. Supervision
 - 2. Time management and planning
 - 3. Personnel management
 - 4. Job application and resume update
 - 5. Employer/employee relationships
- B. Hydraulically Driven Machines
- C. Differentials
- D. Brakes and Steering Systems
- E. Tracks and Undercarriage Components
- F. Final Drives and Tires
- G. Diesel engines
 - 1. Principles of operation
 - 2. Two and four strokes
 - 3. Gasoline engine comparison
 - 4. Troubleshooting
- H. Air Induction System
- I. Cooling System
- J. Valve Train
- K. Diesel Fuel Systems
 - 1. Introduction
 - 2. Injection principles
 - 3. Injection nozzles—capsule, pencil 7000, unit, electronic unit
 - 4. Injection fuel systems—distributor (3054), sleeve metering (3208), new scroll (3406B engines), electronic unit injection (EUI-C10, C12, C15, C16), hydraulic electronic unit injection (HEUI-C7, C9, 3408E)
- L. Diesel Engine Performance
 - 1. Fuel advance curves
 - 2. Horsepower/torque curves
 - 3. Dynamometer testing

Fuels Labs

- Lab 1: 3126 MUI (Mechanical Unit Injection) Injector Synchronization
- Lab 2: 3126 MUI Injector Timing
- Lab 3: 3126 MUI Maximum Fuel Setting
- Lab 4: 3126 MUI Governor Disassembly & Assembly
- Lab 5: Injector Sleeve Removal – 3126 Copper
- Lab 6: Injector Sleeve Removal – 3126 Stainless Steel
- Lab 7: Valve Adjustment – Sequence Method for Inline 6 Cylinder
- Lab 8: Valve Adjustment – Matched Throw Method
- Lab 9: Valve Adjustment – Degree Method
- Lab 10: Testing Nozzles – Capsule
- Lab 11: Testing Nozzles – Pencil
- Lab 12: Testing Nozzles – 7000 Series
- Lab 13: Pump Timing – New Scroll Fuel Pump
- Lab 14: Pump Timing – Sleeve Metered Fuel Pump
- Lab 15: Pump Timing – Distributor Fuel Pump
- Labs 16-18: D & A of New Scroll, Sleeve Metered and Distributor Fuel Pumps
- Labs 19-21: 3406E Engine Simulator Testing and Adjusting
- Labs 22-24: Electronic Unit Injection (EUI) Testing and Adjusting
- Labs 25-27: Hydraulic Electronic Unit Injection (HEUI) Testing and Adjusting

Undercarriage

- Lab 1: Differentials
- Lab 2: Differential Adjustments
- Lab 3: Steering Clutches and Brakes
- Lab 4: Wheel Loader Axle Disassembly and Assembly
- Lab 5: Steel Track Removal and Installation
- Lab 6: Final Drives
- Lab 7: Undercarriage Components and Wear Determination
- Lab 8: ASV Track Removal and Adjustment
- Lab 9: Challenger Belt Removal

Required Materials

Approved eye protection/safety glasses (Z87.1 A.N.S.I.)

Approved footwear

Two work shirts (approximately \$50) – Reedley College Equipment Technician shirt @

Best Uniforms 5091 N. Fresno St. Fresno, CA 93702

Phone: (559) 226-4235

Attendance

Lecture: Attendance is required and roll will be taken at each class meeting. There is no difference between an “excused” or “unexcused” absence. A “tardy” is considered an absence unless the student contacts the instructor at the end of class to change the status from absent to tardy. Two tardies will count as an absence. Any student who misses more than two weeks of class meetings within the first 9 weeks of class may be dropped from the class by the instructor (i.e., class meets two times per week, 4 absences; class meets 1 time per week, 2 absences).

Lab: **Attendance in all labs is mandatory.** Students must make prior arrangements with the instructor to be excused from lab. At that time, the instructor will determine what, if any, make-up work will be appropriate.

Quizzes: There will be no make-ups for quizzes.

Tests: Make-up tests are limited to students who have made arrangements with the instructor prior to the required testing period or those students who have been excused by the SCCCD Dean of Admissions, Dr. John Cummings.

Grading Policy/Scales/Evaluation Criteria

For maximum point consideration, all written assignments and term reports should be typed and double-spaced. Lecture assignments (homework) will be accepted late up to the test for that unit of the course; however, late assignments will be penalized 1/3 of the possible points. Late laboratory assignments turned in within one week of the required due date will be accepted with a penalty equal to 1/3 of the maximum points. Any lab assignment turned in after that time up to the last regular class meeting will be accepted with a 50% penalty.

Point Distribution: 90% = A, 80% = B, 70% = C, 60% = D, 59% & less = D

<u>Assignments & Grades:</u>	Lecture	Homework	100
		Tests – 6 @ 100/each	600
		Quizzes	150
		Final Exam	<u>200</u>
		Lec. Total	1200
Lab	Participation 64 @ 10/each (Timeliness, clean-up, work ethic)	Assignments	<u>560</u>
		Lab Total	1200
		Total = <u>2400*</u>	

Fuels and Tune-Up will constitute two-thirds and Machine Undercarriage will constitute one-third of the MAG 31 grade.

Cheating & Plagiarism

In keeping with the philosophy that students are entitled to the best education available, and in compliance with Board Policy 5410, each student is expected to exert an entirely honest effort toward attaining an education. Violations of this policy will result in disqualification for the course.

Accommodations for Students with Disabilities

If you have a verified need for an academic accommodation or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact the instructor as soon as possible.

Work Ethic - Most students are enrolled in college classes to obtain a quality job or to enhance their skills for advancement with their current employment situation. Employers look for a punctual, responsible individual who is prepared to go to work. Our goal is to replicate the workplace environment where a student can develop and demonstrate these desirable traits.

- **Punctual:** It is customary to arrive at least 5 minutes before work begins. Individuals will be terminated if they are not punctual.
- **Responsible:** It is expected that an employee work every scheduled work day. Individuals will be terminated if they are not responsible.
- **Prepared:** It is expected that an employee be prepared when he/she arrives for work. Students must have work shirts, safety glasses, and appropriate footwear to participate in the laboratory. If a student is not prepared, he/she cannot participate and will receive a zero (see “responsible”).

Language - English is expected to be spoken in class for the following reasons:

- All course content and materials are presented in English and class discussions all take place in English.
- All lab activities are conducted in groups and must have effective communication between all group members.

- Shop activities can be hazardous and it is vital that instructors receive feedback in English to ensure safe practices.
- This policy is designed so that instructors and all students may communicate in a common language.
- All individuals must have freedom of expression and are allowed and encouraged to communicate in the language of their choice outside of class times, including breaks.

Behavioral Standards

- Each student is responsible for his/her own work. Written assignments are not group assignments and no credit will be awarded for students who turn in the same work. Students suspected of cheating on tests and quizzes will receive no credit for that particular assignment and may be removed from the class.
- Turn **off** cell phones when in the classroom or shop. **Texting** is not allowed in class.
- There is **no smoking** allowed in classrooms, shops, or school vehicles. Any smoking needs to take place in designated areas away from equipment and flammable liquids.
- Sleeping is not allowed in class. If you are so tired that you cannot focus during class instruction you will be asked to leave.
- This class is set for the semester. All doctor's appointments, interviews, meetings with counselor, and other types of appointments should be scheduled during your time outside of class.

Important Dates

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| • Last day to drop and qualify for a refund | <u>January 22</u> |
| • Martin Luther King Holiday | <u>January 18</u> |
| • Presidents' Day Holiday | <u>February 12-15</u> |
| • Last day to drop a class and not receive a letter grade | <u>March 12</u> |
| • Spring Break | <u>March 29- April 2</u> |
| • Finals Week | <u>May 17-21</u> |

<p>FINAL EXAM: Fuels – Tuesday, May 18 @ 10:00 a.m. Undercarriage - Tuesday, May 18 @ 2:00 p.m.</p>
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