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| **COURSE INFORMATION** |

**MAG 31 – EQUIPMENT TECHNICIAN**

**Spring 2017 – Code: 59324**

**Fuels & Machine Undercarriage**

**Lecture – Fuels T, Th 8:00-9:30 LSH 1**

**Lab – Fuels & Undercarriage T, Th 10:00-11:50 AGM Shop**

**Lab –Fuels &Undercarriage T, Th 1:00-1:50 AGM Shop**

**Lecture –Undercarriage T, Th 2:00-2:50 LSH 1**

**Instructors: Larry Dinis** **Office Hours:** Monday - Thursday

Office: AGM 5 3:00-4:00

Office #: 638-3641, Ext. 3151

E-mail: [larry.dinis@reedleycollege.edu](mailto:larry.dinis@reedleycollege.edu)

**Ben Drake Office Hours:** Tuesday & Thursday

Office: AGM 5 12:00 – 1:00

E-mail: ben.drake@reedleycollege.edu

**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:**

1. Caterpillar 3-ring binder and related materials
2. MAG 31 Lab Book
3. Book – Diesel Engines and Fuel Systems Repair
4. Book – Introduction to Closed-Loop Oil Systems
5. On-Line Modules Subscription - Caterpillar

**(By second class meeting)**

**Student Learning Outcomes**

**Upon completion of this course student will be able to:**

* *Properly diagnose and repair diesel fuel system*
* *Diagnose and repair equipment undercarriage components on construction and agricultural equipment.*
* *Use acquired knowledge and skills to trouble shoot and repair problems and failures associated with differentials, steering clutches, brakes, final drives and track systems.*

**Fuels Objectives**

1. Demonstrate the proper safety procedures related to fuel systems repair and tune-up
2. Explain governing systems and components
3. Identify fuel system components and their functions
4. Explain horsepower and torque
5. Calculate fuel consumption of a diesel engine
6. Explain emissions requirements as related to diesel engines
7. Exhibit the ability to trouble shoot a diesel fuel system
8. Explain the differences between MUI, EUI, HEUI, and common rail diesel fuel systems
9. Demonstrate electronic diesel engine troubleshooting techniques
10. Demonstrate fuel system adjustments and repair
11. Troubleshoot electronic diesel engine components
12. Explain how various mechanical diesel fuel pumps operate
13. Demonstrate proper valve adjustments on multiple diesel engines
14. Explain the operations of diesel unit injectors
15. Test and diagnose injector functions for proper operation
16. Demonstrate proper diesel fuel injector sleeve removal and installation
17. Describe exhaust after-treatment systems and their function

**Undercarriage Objectives**

1. Demonstrate proper safety procedures related to undercarriage systems as well as the tools and equipment used to repair these systems.
2. Demonstrate the ability to set and measure bearing preload, end-play and backlash adjustments to a differential.
3. Exhibit knowledge of hydrostatic drive systems by measuring charge loop pressures and drive loop pressures.
4. Demonstrate knowledge and understanding of hydraulic and pneumatic brake systems.
5. Use Service Information Systems to access parts, maintenance and service procedures, specifications, as well as testing and adjusting guides to service and repair components and equipment.
6. Remove and install steering clutches on track-type tractors using appropriate tooling and lifting devices.
7. Exhibit knowledge of final drives by identifying the different types, and the components that make up final drives.
8. Demonstrate knowledge of basic brake components; both wet internal and dry external brakes.
9. Remove and replace tracks on a track type tractor and belts on a belted tractor.
10. Demonstrate knowledge of undercarriage track components and a basic understanding of how they wear.

**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. Dynometer testing

**Fuels Labs**

Lab 1: Valve Adjustment – Sequence Method for Inline 6 Cylinder

Lab 2: Valve Adjustment – Matched Throw Method

Lab 3: Valve Adjustment – Degree Method

Lab 4: Pump Timing – New Scroll Fuel Pump

Lab 5: Pump Timing – Distributor Fuel Pump

Lab 6: Testing Nozzles – Capsule, Pencil,7000 Series

Lab 7: 3126 MUI (Mechanical Unit Injection) Injector Synchronization, Injector Timing

Maximum Fuel Setting

Lab 8: Injector Sleeve Removal – 3126 Copper

Lab 9: Injector Sleeve Removal – Stainless Steel C-12

Lab 10: 3406E Engine Simulator Testing and Adjusting

Lab 11: Electronic Unit Injection (EUI) Testing and Adjusting

Lab 12: Hydraulic Electronic Unit Injection (HEUI) Testing and Adjusting

Labs 13: Common Rail Fuel System – 4.4/6.6

Labs 14: EUI Injector Replacement – C12, C15

**Undercarriage Labs**

Lab 1: Differentials

Lab 2: Differential Adjustments

Lab 3: Steering Clutches and Brakes

Lab 4: Wheel Loader Axle D & A

Lab 5: Steel Track Removal and Installation

Lab 6: Final Drives

Lab 7: Rubber Tracks, ASV or Challenger

Lab 8: Ag Tractor Clutch & PTO

Lab 9: Ag Tractor Brakes

Lab 10. Tire Spacing, Wheel Bearings, Ballast

Lab 11. Hydrostatic Trainer

**Required Materials**

* Approved eye protection/safety glasses with **clear** lenses (Z87.1 A.N.S.I.)
* Approved foot wear – **Work Boots with non-slip soles**
* Calculator
* Two work shirts (approximately $60)

TKO Apparel

1776 11th St.

Reedley, CA

859-6074

**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.

Tutoring: All students are required to attend one hour of tutoring for each MAG class he/she is enrolled in. There will be periodic checks on attendance and a point value will be assigned to your grade. This tutoring requirement is designed to greatly improve your grades and acquisition of the subject matter. Those students who truly utilize this time will vastly improve their grades and attainment of the skills and knowledge needed to be an equipment technician.

* Must use your ID to log in and out; this is important as it is how your time will be tracked.
* Must use this time to study. Ask for help on difficult content covered in class, and complete assignment/labs.
* This time is not for listening to music, Facebook, You-Tube videos, and just visiting fellow students.

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 Reedley College Dean of Admissions, Veronica Jury.

On-Line Training: Students are required to complete on-line training modules in addition to regular lecture and lab work. Failure to complete modules in a timely manner will seriously affect your final grade.

Time Clock: All students are required to punch in and out of shop class on a daily basis. Failure to do so will result in an absence. Students are expected to only punch their own cards and cannot, under any circumstances, punch another student’s card. Misuse of the time clock system can result in removal from the class.

**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 = F

Assignments & Grades: **Fuels** Assignments/Quizzes 25%

Midterms/Finals 5%

Lab Assignments 15%

Lab Participation 15%

**Undercarriage** Assignments/Quizzes 15%

Midterms/Finals 5%

Lab Assignments 10%

Lab Participation 10%

**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 than 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 with 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”).
* Professional Appearance: Shirts are to be clean and tucked in at all times. Long pants, work shirts and work boots are required daily. **Failure to adhere to this policy will result in dismissal for the day.**

**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.
* Appropriate language is expected at all times. Many people find cussing and vulgar language offensive so please be aware of your language when on campus or whenever representing the college.

**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.
* Reedley College is a **Tobacco Free Campus**! No tobacco products of **any** form are allowed while on campus. This includes “E-Cigarettes”
* Sleeping is **not** allowed in class. If you cannot stay awake you should go home and get some sleep, or try going to bed at an earlier hour.
* 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**

* Martin Luther King Holiday January 16
* Famous Presidents Days February 17 & 20
* Spring Break April 10 – 14
* Finals Week May 15 – 19
* Graduation Certificate Ceremony May 18

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| **FINAL EXAM:**  **Fuels & Undercarriage – Tuesday, May 16th @ 8am**    **\*Final Exam is mandatory. Failure to participate will result in a non-passing grade** |

**Mechanized Agriculture Program Standards**

The following standards are designed to help ensure that any students wishing to enroll in one or more MAG classes are well prepared for a rigorous course of study. This preparation consists of the following:

* Have strong HS grades, preferably a 2.5 GPA or above. The program is very technical in nature and there are considerable reading and writing requirements.
* Take an aptitude test and perform at or above a basic level. This test consists of mechanical reasoning, reading for comprehension and information, and computations. It is an indicator of both your ability and aptitude in this field of study.
* Have a mechanical background. This could be in the form of work experience, previous shop classes or hobbies that involve mechanics. If you have never worked on equipment or machines, or even your own vehicles, this may not be the program for you.
* Possess a strong willingness to learn and grow. A strong work ethic is essential to succeed in this program.
* Have a clean driving record, pass a drug test, and be employable.
* Students unable to enter a cohort for any of the above reasons may still sign up for a single, stand-alone MAG course.
* Students who enroll in a cohort and perform poorly should be counseled into single courses where there is a greater likelihood of success.

**Daily Program Expectations for All Students**

* Be willing and able to be in class every day. You will be required to punch a time clock in this program on a daily basis. This is job training. Three hours of lecture and three hours of lab is a job!
* Be an active learner – one who is prepared for class each day by bringing along required text materials, takes notes in class, and regularly prepares for lessons.
* Attend required study sessions each week. Each block scheduled class requires one hour of study hall each week. Successful students far exceed this requirement.
* Purchase or acquire the required textbook materials, online modules, uniforms and safety equipment for the program. Must be acquired by the end of the second week.
* Complete the required on-line instructional modules in a timely manner. These training materials reinforce what is taught in the classroom and shop. Students who take the on-line modules seriously consistently perform at the top of the class.

***I have read the above standards and program expectations and agree to do my best to meet them.***

Name (printed) Signature Date