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| **COURSE INFORMATION** |

**MAG 31 – EQUIPMENT TECHNICIAN**

**Fall 2022 – Code: 55519**

**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 #: 494-0300, Ext. 3151 Virtual Friday 10-11am

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

**Darrel Chang Office Hours:** Monday & Wednesday

Office: AGM 5 7:00PM-8:00PM

Cell: 719-452-1242 Tuesday & Thursday

E-mail: [darrel.chang@reedleycollege.edu](mailto:darrel.chang@reedleycollege.edu) 3:00PM-4:00PM

Fri (Virtual) 9am-10am

**Nurse Kelly Murguia**

[kelly.murguia@reedleycollege.edu](mailto:kelly.murguia@reedleycollege.edu)

559-494-3750

**Course Description** 8 Units 4 lecture and 4 lab hours per week

Basic Skills Advisories: Eligibility for ENGL 1A or ENGL 1AH, and MATH 45

Subject Prerequisites/Advisories: None

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.

**Required Text:**

1. CDX Fundamentals of Mobile Heavy Equipment Access Card 1 yr
   1. ISBN – 9781284178470 (On-line Subscription)
2. CDX Fundamentals of Diesel Engines Access Card 1 yr
   1. ISBN – 9781284191820 (On-Line Subscription)
3. Notebook and binder
4. MAG 31 Lab Book
5. Book – Introduction to Closed-Loop Oil Systems
6. On-Line Modules Subscription - Caterpillar
7. Required: 8” – 10” Tablet, I-Pad or Laptop (Cell Phones will not be allowed)
8. No MAC/Apple products as they cause issues with CANVAS

**(By second class meeting)**

**Required Materials:**

* Reedley College Student ID Card (used for clocking and out of labs)
* Approved **clear** eye protection/safety glasses (Z87.1 A.N.S.I.)
* Approved foot wear – **Work Boots with non-slip soles**
* Two work shirts (approximately $80)

California Embroidery

1. Blackstone #103

Fresno CA 93710

559-447-5304

**Student Learning Outcomes**

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

* ***Properly diagnose, tune, and repair diesel fuel system***
* ***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

Lab 13: Common Rail Fuel System – 4.4/6.6

Lab 14: EUI Injector Replacement – C12, C15

Lab 15: Emissions

**Undercarriage Labs**

Lab 1: Differentials

Lab 2: Differential Adjustments

Lab 3: Wheel Loader Axle D & A

Lab 4: Steel Track Removal and Installation

Lab 5: Rubber Tracks, ASV or Challenger

Lab 6: Ag Tractor Clutch & PTO

Lab 7: Tire Spacing, Wheel Bearings, Ballast

Lab 8: Closed Loop Hydraulic Systems

Lab 9: Hydrostatic Testing and Adjustments

**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 one absence. Any student who misses four class sessions within the first nine weeks of class may be dropped from the class by the instructor. Greater than four absences for the entire semester will result in a failing grade. Your attendance rate must be greater than 85% for the semester.

**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.

**Time Card Clock-in:** All students are required to clock-in and clock-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. A participation score is awarded for time cards. **You must receive a minimum of 85% on your time cards to pass this class**.

**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.
* If you clock in for tutoring you are expected to stay in the classroom. You may not clock in and leave for lunch.

**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 acting manager 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.

**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 10% of the possible points per day. Late laboratory assignments will be worth a maximum of 60% of the total points possible.

Point Distribution: 90% = A, 80% = B, 70% = C, 60% = D, 59% and 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 each student is expected to exert an entirely honest effort toward attaining an education. Violations of this policy will result in removal from the course for one day and referral to academic administration. Further violations will result in a failing grade 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 the current employment situation. Employers look for a punctual, responsible individual who is prepare 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 15 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).
* 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.
* This policy is designed so that instructors and all students may communicate in a common language. Safety and the technical nature of this course requires clear communication.
* 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, quizzes or assignments will receive no credit for that particular assignment and may be removed from the class or receive a failing grade**.
* Turn off cell phones when in the classroom or shop.
* Texting in class is **unacceptabl**e. Cell phones are strictly prohibited in class and should not be seen. Unnecessary use of electronic devices will result in dismissal of the class for the day.
* Air pods, ear buds or any device in your ear, except for hearing protection and hearing devices, are prohibited.
* 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 counselors, and other types of appointments should be scheduled during your time outside of class.

**Important Dates**

* Last day to drop and qualify for a refund August 19
* Labor Day September 5
* Last Day to drop a class and not receive a letter grade October 7
* Veterans Day November 11
* Thanksgiving November 24 & 25
* Finals Week December 5–9

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| **FINAL EXAM:**  **Fuels & Undercarriage, Tuesday December 6th @ 8 AM**  **The AED Exit Exam is MANDATORY for all graduating students. Cost is $60. Exam will take place at the end of the semester.**    **\*Final Exam is mandatory. Failure to participate will result in a non-passing grade**  **\*Attendance is also mandatory (85%) – See Attendance Policy above.** |

**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.

On-Campus:

As we return Fall 2021, there are procedures to help keep students, faculty, staff, and their families safe and compliant with state regulations.

Please modify these procedures so that they are appropriate for your own area.

**COVID 19 Safety Practices**

**Masks**: Students, faculty, and staff are required to wear masks that cover the nose and mouth when entering, exiting, while inside buildings and when unable to social distance. Students who have medical need can use face shields as an alternative.

**Handwashing**: Students are required to wash their hands or use hand sanitizer prior entering classroom or other campus buildings.

**Social Distancing**: Maintain a distance at least 6 feet apart from others while on campus.

**Cleaning**: Disinfect areas that students and the public touch frequently. Each service area should develop specific guidelines on frequency based on the nature of student contact.

**Ingress and Egress**: Shared spaces have, when possible, designated an entrance and an exit door to minimize congestion.

**Reminders**: If in an area where students congregate, it might be appropriate to remind students that they should not be on campus if they are experiencing symptoms, that they need to hand sanitize if they have not recently washed their hands, that they should be wearing their masks, and that they need to be 6 feet apart. Signage will be posted, but verbal reminders are appropriate as well, particularly for areas where students form lines.

**Equipment**

**Computers**: Most open computer labs are temporarily closed. Students are encouraged to bring their own computers from home, if possible. If they do not have a home computer, have them contact IT which will issue them a computer to use for the semester. These computers will be used in all locations, including computer labs.

**Lab Computers**: Shut down all office and service area computers after every use. The fog used to disinfect rooms will corrode the computer if the fan is left running.

**HVAC**: Appropriate ventilation is an important preventative measure; however, do not assume that your classroom door or windows should be open. HVAC systems are being adjusted for appropriate airflow. If your area is on Central Plant or Package HVAC systems, opening the doors and windows decreases ventilation. If your building utilizes evaporative cooling or has no cooling system, doors and windows can be opened if appropriate for your classroom setting. For more information contact Building Services.

**Policy and Process**

All employees must complete the health screening every day they come to campus (on the portal page). If you are not feeling well, have been exposed to an individual who has tested positive for COVID-19, or you have tested positive for COVID-19, stay home and contact your supervisor immediately and contact Human Resources for information on leave options. Close contact is defined as “someone who has spent 15 minutes or more time within 6 (six) feet or less of individual who has been exposed or is positive for COVID-19 while unmasked. COVID-19 symptoms are fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, or diarrhea.

* High risk individuals: For students and staff considered to be a member of a vulnerable population as a result of underlying medical conditions, age or other co-morbidities, or for those that need religious accommodation, are pregnant or nursing, or live with a person with compromised immunity, the College will work with internal partners, including Human Resources, student services offices, counseling, instruction and operations to provide additional, non-discriminatory protocols to reduce risk of infection. This will include a process for making requests for reasonable accommodations by an at-risk person through normal institutional processes. Human Resources and have developed a process through which faculty, staff, and students are informed about how to access the accommodations process on the College’s website.
* Symptomatic Students: If students are displaying symptoms of COVID, you are encouraged to remind them that they are not to come to campus with symptoms. Encourage them to go home and contact their healthcare provider or the Reedley College Health Services.
* Common COVID-19 Symptoms include, but are not limited to:
* Respiratory symptoms: cough, sore throat, shortness of breath
* Fever of 100.4 degrees F or higher or chills
* Review [CDC’s COVID-19 symptom](https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html) for a full list.

COVID 19 Positive Student: If you have a student who tells you he or she is symptomatic or positive for COVID 19, tell the student to stay home and notify your supervisor and Nurse Kelly Murguia.

1. You may be required to quarantine for 14 days based on the Fresno County Department of Public Heath guidelines.
2. Consider visiting an available testing site in the area.

**Enforcement of Policies**

We have all seen that there can be push back on COVID mask policies. We ask that you remind students that our policies are following legal mandates from our governor and CDC Guidance for educational areas. If students do not follow policies, we encourage you to use the following as a baseline for your response:

1. Remind students that the policy is a campus-wide policy.
2. Have an individual conversation/dialogue with the student about why they are not complying. Try to resolve the situation yourself.
   1. If they do not have a mask, refer them to the free mask sites.
   2. If the student has a medical concern about using a mask, refer the student to Health Services.
   3. Document your interaction using a COVID Compliance Flag in Starfish. This flag will not automatically be sent to the student; however, COVID health services information will be forwarded to the student.
   4. If the situation is resolved between you and the student, document it with the flag, but close the flag when resolved.
3. If the student still does not comply, remove the student from the class for the day. Immediately contact the Dean of Students, Shannon Solis to document the encounter.

We discourage you from calling the police unless the situation escalates to an emergency. Work with the Dean of Students and allow the Behavior Intervention Team to deal with the student and to coordinate with police as necessary. (Some of the details of the Starfish notification are still being developed. Anticipate a separate, more thorough, communication on this closer to the start of the semester.)

**Modifying Policies**

These policies may need to be modified for your own work situations.  In making these modifications, please consider the following:

* Most Effective Measures: The most effective measures are facial coverings, handwashing, social distancing, use of proper hygiene when sneezing or coughing, and enhanced cleaning.  If you must modify these policies, keep these practices in mind.
* Follow the directives set by the Chancellor of State Center Community College District (SCCCD), the Fresno County Department of Public Health, the California Department of Public Health and the CDC guidance for institutions of higher education.  Talk to your Dean or the College Nurse if you need clarification.

These practices were developed by the Reedley College COVID-19 Taskforce, with broad representation from faculty and staff from multiple areas of campus.  We all know that these are unprecedented times; this guidance is subject to change as the situation evolves.

Additionally, we know that unforeseen problems might arise.  If you have a question or concern that has not been addressed by this guidance, please contact your area’s vice president, or another member of the COVID-19 Taskforce, who will take the concern to the Taskforce for discussion.  The COVID-19 Taskforce will host open forum trainings during the first weeks of classes to provide updates, hear concerns, and discuss solutions.