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| **COURSE INFORMATION** |

**MAG 30 – EQUIPMENT TECHNICIAN**

**Electrical, Hydraulic Systems & Welding**

**Fall 2023 – Code: 57139**

 **Electrical, Hydraulics & Welding M,W 8:00-9:50 AGM Shop**

 **M,W 10:20 -11:50 LSH 1**

 **M,W 1:00-1:50 LSH 1**

 **M,W 2:00-2:50 AGM Shop**

 **F 7:00-9:40 IND 19 Lab**

 **F 10:00-11:40 LSH 1**

**Instructors: Arthur Faria**

Office: AGM 5

**Office Hours –**

**Deftereos -** M – TH 3:00 – 4:00 pm

 F (Virtual) 10:00am-11:00am

**Faria -** M & WED 7:00 – 8:00 pm

TUES & TH 3:00 – 4:00 pm

**Williams – TBA**

**Mancini - TBA**

Email: arthur.faria@reedleycollege.edu

Cell: 209-329-3074

**Nick Deftereos**

Office: AGM 5

Office: 494-0317

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 **John Williams**

Office: AGM 5

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Email: john.williams@reedleycollege.edu

Coordinator, Student Health Services:

Kelly Murguia

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559-494-3750

**Andrew Mancini**

Office: IND

Cell #:

Email: andrew.mancini@reedleycollege.edu

**Course Description** 11 Units 8 lecture and 9 lab hours per week

This course provides in-depth instruction in machine electrical systems, hydraulic systems found on mobile equipment, and welding and fabrication skills common to agriculture and construction equipment. Students will receive hands-on training on starting, charging, and electronic monitoring systems as they develop analytical skills needed for service and repair of diesel equipment. Hydraulic fundamentals and troubleshooting techniques will be reinforced through machine testing and adjusting. Students will also receive training and instruction in welding and fabrication principles and applications required for the entry level equipment technician.

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

Subject Advisories: None

**Required Text:**

* CDX Fundamentals of Mobile Heavy Equipment Access Card 1 yr
	+ ISBN – 9781284178470
* MAG 30 Lab Book
* Workbook: Practical Hydraulics Simulator Activities (FPTI)
* On-Line Modules Subscription – Caterpillar
* Required: 8”-10” Tablet or Laptop (Cell Phones will not be allowed)
	+ NO APPLE PRODUCTS
* Recommended: How to Interpret Fluid Power Symbols, Rory S. McLaren
* Recommended: Introduction to Closed-Loop Oil Systems (FPTI)

**Required Materials:**

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

California Embroidery

6725 N. Blackstone #103, Fresno, CA. 93710

(559)447-5304

**Student Learning Outcomes**

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

* **Perform basic welding/cutting processes necessary to fabricate tools and repair machinery and implements.**
* ***Service, troubleshoot, and repair hydraulic and hydrostatic systems.***
* ***Troubleshoot and repair common electrical problems and failures found on 12 and 24-volt direct current systems.***

**Hydraulics Objectives**

1. Demonstrate proper safety procedures relating to hydraulics as well as the tools and equipment used to repair these systems
2. Explain the physical laws related to enclosed liquids
3. Test basic hydraulic principles on systems including open and closed center systems
4. Explain the principles of hydrostatic systems and their application
5. Evaluate gear, vane, and piston pumps/motors and their controls
6. Describe the proper application of pressure, directional, and volume control valves.
7. Demonstrate the proper function and operation of various hydraulic valves
8. Identify various hydraulic cylinders and describe their operation
9. Solve problems involving pressure and flow to determine hydraulic cylinder force and speed
10. Identify various hydraulic accumulators and describe their operation
11. Create a hydraulic hose assembly utilizing industry standards
12. Identify fluid power fittings including STOR, ORFS, JIC, SAE, and NPTF
13. Evaluate different filters based on efficiency, construction, and materials
14. Perform basic hydraulic maintenance procedures
15. Use hydraulic system nomenclature and symbols to read and interpret schematics
16. Link principles of hydraulic theory to machine systems by interpreting pressure and

flow readings from gauges.

1. Safely diagnose, troubleshoot, and adjust hydraulic and hydrostatic systems utilizing pressure gauges, flow gauges, and appropriate service literature

**Electrical Objectives**

1. Demonstrate proper safety procedures related to electrical systems as well as the tools and equipment used to repair these systems.
2. Explain the difference between electron and conventional theories of electricity.
3. Use Ohm’s law as it applies to series and parallel circuits to determine voltage, resistance and amperage.
4. Demonstrate knowledge of the laws and applications of magnets, electromagnets and magnetic fields.
5. Demonstrate the ability to use digital multimeters and ammeters to measure voltage, resistance and amperage on various systems.
6. Analyze 12 and 24 volt starting systems using a digital voltmeter and ammeter and perform basic repairs to these systems.
7. Analyze 12 and 24 volt charging systems using digital voltmeter and ammeter and perform basic repairs to these systems.
8. Troubleshoot and repair lighting and accessory systems used on mobile equipment.
9. Read, draw and interpret electrical schematics to perform basic electrical repairs on equipment.
10. Use computer diagnostic tools to retrieve fault codes and perform diagnostic analysis of machine electrical systems.
11. Demonstrate the ability to diagnose and repair circuit faults such as opens, shorts and resistive faults.
12. Demonstrate the ability to use schematics to wire machine electrical systems
13. Diagnose and repair electronic monitoring systems.
14. Demonstrate the ability to make repairs to various electrical connectors and wiring harnesses.

**Welding Objectives**

1. Demonstrate proper safety procedures relating to welding and fabrication as well as the tools and equipment used.
2. Demonstrate proper welding techniques using shielded metal arc welding, metal inert gas processes, and oxy-fuel processes.
3. Prepare metal and materials for welding.
4. Understand the terminology associated with various welding processes.
5. Select and order appropriate materials and supplies to construct a project.
6. Demonstrate proper cutting technique using oxy-fuel processes and plasma processes.
7. Construct a project approved by the instructor.
8. Accurately use measuring tools such as tape measures and squares to measure and lay out projects.
9. Develop basic drawings and materials lists needed to construct a project.
10. Identify and use various hand and power tools related to welding and fabrication.

**Course Outline**

A. Shop Safety Practices

B. Metals

C. Arc Welding Processes

D. Oxyacetylene Welding Processes

E. Project Design and Construction

F. Theory of Electricity

G. Electrical Diagnostic Equipment

H. Starting Systems

I. Charging Systems

J. Accessory Circuits

K. Electronic Monitoring Systems

L. Basic Principles of Hydraulics

M. Hydraulic Pumps and Motors

N. Hydraulic Valves

O. Hydraulic Cylinders

P. Hydraulic Accessories

Q. General Maintenance

R. Diagnosis and Testing of Hydraulic Systems

Electrical Labs

Lab 1: Use of the Digital Multimeter

Lab 2: Voltage, Current and Resistance

Lab 3: Series and Parallel Circuits

Lab 4: Machine Component Identification

Lab 5: Battery Load Test

Lab 6: Starting System Tests

Lab 7: Connector Lab

Lab 8: Alternator Output Test

Lab 9: Engine Wiring

Lab 10: Black Box Wiring

Lab 11: Electrical Troubleshooting of Black Boxes

Lab 12: Lighting Circuits

Lab 13: Electronic Components – Input Devices

Lab 14: Electronic Components – PWM and Frequency Signals

Hydraulic Labs

1. Introduction to Hydraulic Trainer – Schematic Symbols

2. Introduction to Hydraulics – Pascal’s Law, Bernoulli, Force/Pressure/Area

3. Basic Circuit Development and Familiarization – Relief Valves, DCV

4. Directional Control Valves

5. Relief Valves and Series Resistance

6. Hydraulic Hoses and Fittings

7. Pressure Control Valves

8. Flow Control Valves

9. Fixed Displacement Pumps – Gear, Vane

10. Variable Displacement Pumps - Piston

11. Cylinders

12. Machine Component Identification and Testing

Welding Labs

Lab 1: Oxyacetylene Welding Assignments

Lab 2: Oxyacetylene Cutting

Lab 3: Shielded Metal Arc Welding Assignments

Lab 4: Gas Metal Arc Welding Assignments

Lab 5: Project Plans and Bill of Materials

Lab 6: Project Construction

**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 Cards:** 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. 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.

**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.

**All late assignments will be penalized 10% Each Day, including Sat and Sun**.

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

Assignments & Grades:

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| --- | --- | --- |
| Electrical | Assignments/Quizzes | 16% |
|  | Midterm/Final | 4% |
|  | Lab Participation | 10% |
|  | Lab Assignments | 10% |
|  |  |  |
| Hydraulics | Assignments/Quizzes | 16% |
|  | Midterm/Final | 4% |
|  | Lab Participation | 10% |
|  | Lab Assignments | 10% |
|  |  |  |
| Welding | Assignments/Quizzes | 8% |
|  | Midterm/Final | 2% |
|  | Lab Participation | 5% |
|  | Lab Assignments | 5% |

**Failure to take the AED Test will result in a FAILING GRADE.**

**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 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”).
* 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 18
* Labor Day September 4
* Last Day to drop a class and not receive a letter grade October 6
* Veterans Day November 10
* Thanksgiving November 23 & 24
* Finals Week December 4–8

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| **FINAL EXAM:** **Electrical and Hydraulics – Monday, December 4th @ 12 pm****Welding – Wednesday, TBA@ 10am****The AED Exit Exam is MANDATORY for all graduating students. Cost is $60. Exam will take place at the end of the semester. Failure to take the AED Test will result in a FAILING GRADE.****\*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.