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| **COURSE INFORMATION** |

**MAG 21 – EQUIPMENT TECHNICIAN**

**Power Train I and Mobile Vehicle Air Conditioning**

**Fall 2023 – Code: 57113**

**Lab –Transmissions & AC T, Th 8:00-9:50 AGM Shop**

**Lecture – Transmissions T, Th 10:20-11:50 LSH 1**

**Lecture – Air Conditioning T, Th 1:00-1:50 LSH 1**

**Lab – Transmission &Air Conditioning T, Th 2:00-2:50 AGM 5 Shop**

**Instructors:**

**Arthur Faria**

**Office Hours –**

**Faria –** Tu & Thu 10:00 PM-11:00 PM

Office: AGM 5

Office #: 494-0300 Ext 3138

E-mail: [arthur.faria@reedleycollege.edu](mailto:arthur.faria@reedleycollege.edu)

**Nick Deftereos**

**Office Hours –**

**Deftereos -** M – TH 3:00 – 4:00 pm

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

Office: AGM 5

Office #: 494-0317

Email: [nick.deftereos@reedleycollege.edu](mailto:nick.deftereos@reedleycollege.edu)

Coordinator, Student Health Services:

**Kelly Murguia**

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

559-494-3750

**Course Description** 8 Units 6 lecture and 6 lab hours per week

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

Subject Prerequisites/Advisories: None

This course provides in-depth instruction in equipment transmission systems and power equipment air conditioning and heating systems. Equipment transmission systems include clutches, torque converters, hydrostatic applications and manual powershift transmissions. Students will also receive career preparation instruction.

**Required Text:**

1. CDX Fundamentals of Mobile Heavy Equipment Access Card 1 yr
   1. ISBN – 9781284178470
2. CDX Automotive Heating, Ventilation, and Air Conditioning
   1. ISBN - 9781284196689
3. MAG 21 Lab Book
4. On-Line Training Modules Subscription – Caterpillar
5. Required: 8” – 10” Tablet or Laptop (Cell Phones will not be allowed)

**NO APPLE PRODUCTS**

**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 student will be able to:**

* ***Achieve section 609 Certification as required to service/repair mobile vehicle air conditioning systems by the Clean Air Act.***
* ***Service, trouble-shoot, or repair mobile air conditioning and heating systems.***
* ***Trouble-shoot and repair transmission systems.***

**Course Objectives**

**In the process of completing this course, students will be able to:**

**Transmission Objectives**

1. Demonstrate proper safety procedures related to transmissions as well as the tools and equipment used to repair these systems.
2. Demonstrate knowledge and understanding of theory, operation, and terminology related to transmissions, including gear ratios, types of gears, and clutches.
3. Demonstrate the ability to correctly disassemble, repair and reassemble a torque converter.
4. Demonstrate the ability to correctly disassemble, repair and reassemble a flywheel clutch.
5. Perform correct disassembly and assembly and trace power flow of a planetary power-shift transmission.
6. Perform correct disassembly and assembly and trace power flow of countershaft power-shift transmission.
7. Demonstrate ability to disassemble, inspect and identify components, and reassemble hydraulic control valves used in power-shift transmissions.
8. Identify various bearing common to drive systems and demonstrate correct procedures in handling bearings.
9. Measure clutch wear using outside micrometers and dial calipers to determine wear and reusability.
10. Use reusability guidelines and service literature to determine component wear.
11. Diagnose and repair transmission systems using pressure gauges, service literature and operational checks.
12. Use Service Information Systems to access parts, maintenance and service procedures, specifications, and testing and adjusting guides to service and repair components and equipment.
13. Exhibit habits of cleanliness and organization in shop practices.
14. Demonstrate ability safely rig and lift heavy components using chains, straps and hoists

**Air Conditioning Objectives**

1. Demonstrate proper safety procedures relating to air conditioning systems as well as the tools and equipment used to repair these systems
2. Explain the role of heat and pressure in an air conditioning system
3. Describe the impact of refrigerants on the environment, and human health
4. Recognize the characteristics of refrigerants and their oils
5. Identify basic system components of an air conditioning system used on power equipment
6. Explain the operation of a basic air conditioning system including the state of the refrigerant and its cycles
7. Correctly connect and disconnect air conditioning service equipment in order to minimize the venting of refrigerant into the atmosphere
8. Complete a performance test of a mobile air conditioning system
9. Perform air conditioning system service practices such as recovering, recycling, evacuating, replenishing, re-charging, and leak detection.
10. Use electrical schematics to troubleshoot electrical problems in machine air conditioning systems
11. Troubleshoot air conditioning systems by interpreting pressure/temperature readings.

**Course Outline**

The instructor will determine the order in which the following will be presented and developed.

It is also probable that several skills may be served by the same assignment.

A. Introduction to Power Trains

B. Clutches

1. Purpose

2. Dry type assemblies

3. Oil type assemblies

C. Torque Converters

1. Application, theory, components

2. Operation principles

D. Introduction to Transmissions

1. Power flow

2. Transmission design

3. Operating principles and functions

E. Transmission Types

1. Manual shift

2. Planetary powershift

3. Countershaft powershift

4. Hydrostatic

F. Basics of Air Conditioning

1. Basic principles of refrigeration

2. States of matter

G. Refrigerants and Oil Refrigerants

1. Refrigerants – R 12 and R 134 A

2. Refrigeration oils

H. Service Equipment

1. Gauge and manifold set

2. Refrigerant recovery – recycling station

I. Inspecting and Diagnosing the System

1. Visual inspection

2. Troubleshooting customer complaints

J. Career Preparation

1. Orientation to college

2. Career opportunities

3. Job applications

4. Résumé

5. Job search

**Transmissions and Torque Converter Labs**

1. Dry Clutch Disassembly and Assembly 3 hours
2. Torque Converter Disassembly and Assembly 5 hours
3. Torque Divider Lab (Group Demo) 2 hours
4. Torque Converter Stall Test 2 hours
5. Backhoe Loader Transmission D & A 15 hours

(Direct Drive Synchromesh)

1. Challenger 45 Transmission D & A 15 hours

(Countershaft Powershift)

1. Challenger 45 Electronic Control Valve 3 hours
2. 920 Wheel Loader Transmission D & A 15 hours **\***

(Planetary Powershift) or

1. Challenger 65 Transmission D & A 15 hours \*

(Combination Countershaft/Planetary Powershift)

1. 920 Wheel Loader Control Valve 2 hours
2. Challenger 65 ICM Control Valve 2 hours
3. Testing and Adjusting Challenger 65 Transmission 3 hours

Hydraulic System

1. Testing Transmission on Mid-Size Wheel Loaders 3 hours

**\***Perform Lab 8 or Lab 9, but not both.

Hours listed are estimated times to complete labs.

**Air Conditioning Labs**

Lab # Lab Name

1. Temperature/Pressure Relationships and Manifold Gauge Sets
2. Orifice Tube System: Component Identification
3. Thermostatic Expansion Valve System: Component Identification
4. “H” Block Expansion Valve System: Component Identification
5. System Diagnosis
6. Recovering A/C Refrigerant
7. A/C System Evacuation
8. A/C Leak Detection
9. A/C Compressor Replacement and System Flushing
10. A/C Component R/R
11. A/C Refrigerant Charging
12. A/C Electrical System Schematic
13. A/C Electrical Wiring
14. A/C Troubleshooting and Repair

**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.

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.

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. A participation score is awarded for time cards. You must receive a minimum of 85% on your time cards to pass this class.

**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:

**Transmissions** Assignments/Quizzes 25%

Midterms/Finals 5%

Lab Assignments 15%

Lab Participation 15%

**Air Conditioning** Assignments/Quizzes 15%

Midterms/Finals 5%

Lab Assignments 10%

Lab Participation 10%

**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:**  **Transmission & AC Exams: Tuesday, December 5th @ 12 pm**  **Section 609 AC Exam ($15.00): Thursday, November 30th @ 1pm**  **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.** |