Syllabus for AT-14

Course Information

Semester & Year: Fall 2022
Course ID & Section #: AT-14-E3723 Automotive Drivetrain & Manual Transmissions
Instructor's name: Anibal Florez
Day/Time of required meetings: Tuesdays and Thursdays at 8:15am – 12:35pm
Location: AT-128 and AT-129
Course units: 4

Instructor Contact Information

Office location: AT-141 is my office.
Office hours: By appointment is preferred.
Phone number: 707-476-4373
Email address: Anibal-Florez@redwoods.edu

Catalog Description

A course covering theory and principles of manual drivetrains and axles, clutches, drive shafts, half shafts, variable and constant velocity joints, differentials, rear wheel drive axle assemblies, all wheel drives, and four wheel drives. Gear types, ratios, compound ratios, and current noise, vibration, and harshness diagnostic routines will be discussed. Diagnosis, repair, overhaul, and adjustment procedures for common domestic, import, and light truck drivetrain components will be emphasized. The course is designed in conjunction with National Automotive Technicians Education Foundation (NATEF), standards and subsequently will prepare the student for the ASE Manual Drivetrain and Axle Certification Examination.

Course Student Learning Outcomes

1. Perform general drivetrain diagnosis

2. Diagnose and repair clutches.

3. Diagnose and repair transmissions and transaxles.

Prerequisites/co-requisites/ recommended preparation

It is strongly suggested as preparation for this class that each student start reading the text before the semester begins.

Textbook information

Title & Edition: Automotive Drivetrain & Manual Transmissions

Author: Keith Santini, Kirk VanGelder

ISBN: ISBN: 978-1-284-14526-7

Accessibility

Students will have access to online course materials that comply with the Americans with Disabilities Act of 1990 (ADA), Section 508 of the Rehabilitation Act of 1973, and College of the Redwoods policies. Students who discover access issues with this class should contact the instructor.

College of the Redwoods is also committed to making reasonable accommodations for qualified students with disabilities. If you have a disability or believe you might benefit from disability-related services and accommodations, please contact your instructor or Disability Services and Programs for Students (DSPS). Students may make requests for alternative media by contacting DSPS based on their campus location:

- Eureka: 707-476-4280, student services building, 1st floor
- Del Norte: 707-465-2324, main building near library
- Klamath-Trinity: 530-625-4821 Ext 103

During COVID19, approved accommodations for distance education classes will be emailed to the instructor by DSPS. In the case of face to face instruction, please present your written accommodation request to your instructor at least one week before the first test so that necessary arrangements can be made. Last-minute arrangements or post-test adjustments cannot usually be accommodated.

Technology

During this semester, this course will be in part online. This means that each student must be aware of the technological requirements to be successful in this class.

Each student will be responsible for completing tasks online via CANVAS. This includes homework, watching demonstration videos and recorded lecture materials, participating in online discussions, communicating with your instructor as well as other students.

This means that students will have a greater chance of success with a laptop or home computer and access to WiFi.

Online courses require adequate computer skills. If you are worried about your computer skills, please let me know, because I can help. But to check yourself before we get started, you should be able to:

- navigate a class in Canvas
- receive and respond to messages sent to your CR email account (This means you need to CHECK your CR email!)
- use a word processor program (such as Microsoft Word or Google Docs)

It is your responsibility to meet the technological demands of the course, which may often include troubleshooting technological adventures.

Computer and Hardware Requirements

- Computers: You should plan on doing the chapter quizzes from a reasonably recent model notebook or desktop computer (Mac or PC). We don't recommend that you plan on participating in this class solely from a portable device (phone or tablet). Please let me know if this will be an issue for you, and we can try to help.
- Portable Devices: You can use recent model portable devices (such as Android or iOS phones & tablets) for some things in this class. If you do decide to use your portable device for some of your class work,

use the free Canvas app (called "Canvas by Instructure") available in iTunes (for iOS) and the Google Play Store (for Android). This app is much better than trying to connect to Canvas using a web browser on a portable device.

Connection and Software Requirements

It is important that you set yourself up for success by making sure that you have the necessary internet connection and software in order to participate fully in the course. Please make sure that you have the following set up by the first week of class:

- High-speed internet: You should have high-speed internet (such as broadband) service from cable, DSL, or satellite providers as there are video lectures as part of this course, and they require this speed. You need to have reliable access to the internet for the duration of the course. Anticipate problems with your computer and internet access (including power outages) by not waiting until the last minute to submit assignments. It is your responsibility to meet the class deadlines.
- Browsers - You will need to use the most recent version of one of the following browsers in order to best access the course and activities; Mozilla Firefox (10 or higher), Chrome (54.0.2840.99 m or higher), or Safari (1.2 or higher). We don't recommend using Internet Explorer as it doesn't seem to play well with Canvas.
- Word Processing - You may need Microsoft Word for writing assignments in the class. But we have good news! All students at CR have access to Office 365 (Word, PowerPoint, Excel, and OneNote) free with a valid @mycr.redwoods.edu email account. Go to https://office.com/getoffice365 (Links to an external site.) to get started. (There are also free options for tools like this, such as Google docs (Links to an external site.) or OfficeLibre. (Links to an external site.) Google docs requires a gmail account, which your mycr email actually IS.)
- Acrobat Reader – Adobe Acrobat Reader DC (Links to an external site.) is a free program that will allow you to read and download pdf files.
- Technology Support: Before contacting Technical Support please visit the Online Support Page (Links to an external site.). For password issues with Canvas, Web Advisor or your mycr.redwoods.edu email, contact its@redwoods.edu or call 707-476-4160 or 800-641-0400 ext. 4160 between 8:00 A.M. and 4:00 P.M., Monday through Friday.

Communication Guidelines

- Response times to emails and messages – in general I will reply within a couple of business days.
- My general availability – Office hours every Tuesday and Thursday, email and phone anytime.
    - I prefer emails but you can call my office anytime. Emails are usually the better way.
    - Please try to schedule an office visit. However, you are always welcomed to stop by.
- Please make use of my office hours. Come on by! Even if its outside of the office hour scheduled.
- Timeline for offering substantive feedback on assignments – in general about a week.
- Expectations for how students should engage with each other – You are all peers taking part in the same automotive program. Each of you have different skill sets and knowledge. Everyone, including me, will benefit from open and honest communication that is respectful and encouraging. We are all in this together, let us bring each other up.

If you have a question or concern, please, please, PLEASE get ahold of me. I am very available to help you, especially as you work to figure out how to be successful in this class. So, if you have a question, here are some guidelines to follow:

- **Might your question benefit other people in the class?** Then please post it in the related discussion forum in Canvas. This forum is included in every module in the course, so it will be easy for you to find, and I will check it at least once a day during the week and at least once over the weekend.
- **Is your message private?** Please send me a message using the messaging tool in Canvas (just click on the INBOX button in the left toolbar). You are also welcome to email me.

You can also always call me on my "on campus" office phone (707-476-4373). Regardless of how you reach out, if you don't hear back from me within 48 hours of sending your message, you can assume I did not receive it (or it got lost in my chaos)…so please resend.

Finally, **please be polite.** In an online environment, this is called **netiquette**. Sometimes it is difficult to convey nuance or humor through written (electronic) communication. Just be respectful to your classmates and be kind, considerate, and forgiving in all of your posts in the discussion forums. Adhere to the same standards of behavior online that you follow in real life, because you don't want to forget: Real humans read your posts. After all, our Canvas space is our classroom, and we want to create a positive, collaborative, interesting community.

Note: Additional policies may be added as I deem necessary to provide you with the best learning environment possible.

Instructor Expectations of Students

Your commitment will require at least as much time as you dedicate to a traditional class. A typical three credit hour class will require about nine hours per week of your time. You will need to carefully read the textbook chapters, participate in activities, and participate in online discussions if any, complete quizzes and tests including the final exam. Conscientiousness, attention to details, and skills in reading and writing are critical for success.

Student Expectations of Instructor

I will access the class website regularly and respond to posted questions and messages. Additionally, I read every discussion forum post and occasionally participate. There is also regular instructor-based communication with weekly announcements, lectures, evaluative feedback to your discussion posts, completed labs, homework, answer questions and or email/message students who fall behind.

Support for learners during COVID-19

As the faculty and students adjust to this change, clear communication about student needs will help everyone be successful. Please let me know about any specific challenges or technology limitations that might affect your participation in class. I want every student to thrive.

Supplies

1. Each student is required to purchase in advance and have available a #2 pencil or pen.
2. Safety glasses are required for all lab activities. Students are required to purchase OSHA/ANSI approved safety glasses and wear them at all times when working in the lab.
3. Work attire is recommended. Supply your own coveralls, shop coat or work pants, shirt and closed toed shoes.
4. Class textbook(s).
5. Each student should be prepared to supply any additional personal protective equipment not furnished

by the college.

Course Requirements

1. Complete the assignments & tests– Read assigned chapters prior to coming to class.
2. Access to the internet to actively participate in online assignments.
3. Regular attendance.
4. Actively participate in shop assignments while striving for improvement.
5. Refrain from using personal electronic devices unless it pertains to the class.
6. Must use safety glasses.
7. Everyone will comply with the latest COVID-19 Social Distancing and Safety Guidelines.
8. No student parking allowed in the automotive compound unless otherwise discussed.

Degree/Certificate

An Associate of Science Degree in Automotive Technology is available as well as two types Certificates of Achievement. For more information consult the college catalog for specific requirements and/or contact Counseling/Advising at 476-4150 to develop a student education plan.

Automotive Work Experience

Additional units are available for working in the field. Contact the Work Experience Coordinator at 476-4341

Course Evaluation

Your performance objectives, exams, and laboratory activities will be translated to points and points to grades. There are 1000 possible points, and the following distribution will guarantee the following:

1000 - 900 = A
899 - 800 = B
799 - 700 = C
699 - 600 = D
599 - 500 = F

Course Schedule

This course is scheduled to meet twice a week. Tuesdays and Thursdays at 8:15am and class ends by 12:35pm

During each of those 4.25 we will carry out specific shop activities related to the textbook material.

It is important that each student do the scheduled reading before coming to class. There is a lecture each day and the shop time that follows the lecture is to reinforce the concepts and theories that each student is responsible for studying ahead of class time.

Attendance

The college assumes that students will attend every session of a class for which they are registered. If, however, attendance is irregular, students may be dropped from a class. Excessive absence is defined as a total of absences which equal two weeks in a 16 week semester, for a class meeting twice per week that would equate to 4 absences. For attendance purpose, the college regards a laboratory session as the equivalent of one class meeting.

Veterans and financial aid recipients should remember that should they drop below the number of units required of them by the Veterans Administration or financial aid office for any reason during the semester, including being dropped from a class for excessive absences, they will lose part of the government assistance allowances and may be required to repay funds already disbursed.

In any event if an attendance problem does develop, work with the instructor to resolve it. The purpose here is to see what we can do together to keep you in the class in order to help you master the course content.

Course Attendance Policy

Attendance will be taken at the start of each class session. **Students who accumulate 4 absences during the first 10 weeks of class will be dropped from this class by the instructor, no exceptions.**
Punctuality is essential in the workplace and is considered respectful of fellow students and instructors. Excessive tardiness can affect your score as well. Less time present means you have less time to complete tasks.

Students who have experienced extenuating circumstances can complete & submit the **Excused Withdrawal Petition** to request an Excused Withdrawal (EW) grade instead of the current Withdrawal (W) or non-passing (D, F & NP) grades. The EW Petition is available from the Admissions and Records Forms Webpage. Supporting documentation is required.

Academic dishonesty

In the academic community, the high value placed on truth implies a corresponding intolerance of scholastic dishonesty. In cases involving academic dishonesty, determination of the grade and of the student's status in the course is left primarily to the discretion of the faculty member. In such cases, where the instructor determines that a student has demonstrated academic dishonesty, the student may receive a failing grade for the assignment and/or exam and may be reported to the Chief Student Services Officer or designee. The Student Code of Conduct (AP 5500) is available on the College of the Redwoods website. Additional information about the rights and responsibilities of students, Board policies, and administrative procedures is located in the College Catalog and on the College of the Redwoods website.

Disruptive behavior

Student behavior or speech that disrupts the instructional setting will not be tolerated. Disruptive conduct may include, but is not limited to: unwarranted interruptions; failure to adhere to instructor's directions; vulgar or obscene language; slurs or other forms of intimidation; and physically or verbally abusive behavior. In such cases where the instructor determines that a student has disrupted the educational process, a disruptive student may be temporarily removed from class. In addition, the student may be reported to the Chief Student Services Officer or designee. The Student Code of Conduct (AP 5500) is available on the College of the Redwoods website. Additional information about the rights and responsibilities of students, Board policies, and administrative procedures is located in the College Catalog and on the College of the Redwoods website.

Inclusive Language in the Classroom

College of the Redwoods aspires to create a learning environment in which all people feel comfortable in contributing their perspectives to classroom discussions. It therefore encourages instructors and students to use language that is inclusive and respectful.

Setting Your Preferred Name in Canvas

Students have the ability to have an alternate first name and pronouns to appear in Canvas. Contact Admissions & Records to request a change to your preferred first name and pronoun. Your Preferred Name will only be listed in Canvas. It does not change your legal name in our records. See the Student Information Update form.

Canvas Information

If using Canvas, include navigation instructions, tech support information, what Canvas is used for, and your expectation for how regularly students should check Canvas for your class.
Log into Canvas at https://redwoods.instructure.com
Password is your 8 digit birth date
For tech help, email its@redwoods.edu or call 707-476-4160
Canvas Help for students: https://www.redwoods.edu/online/Help-Student
Canvas online orientation workshop: https://www.redwoods.edu/online/Home/Student-Resources/Canvas-Resources

Community College Student Health and Wellness

Resources, tools, and trainings regarding health, mental health, wellness, basic needs and more designed for California community college students, faculty and staff are available on the California Community Colleges Health & Wellness website.

Wellness Central is a free online health and wellness resource that is available 24/7 in your space at your pace.

Students seeking to request a counseling appointment for academic advising or general counseling can email counseling@redwoods.edu.

Emergency procedures / Everbridge

College of the Redwoods has implemented an emergency alert system called Everbridge. In the event of an emergency on campus you will receive an alert through your personal email and/or phones. Registration is not necessary in order to receive emergency alerts. Check to make sure your contact information is up-to-date by logging into WebAdvisor https://webadvisor.redwoods.edu and selecting 'Students' then 'Academic Profile' then 'Current Information Update.'

Please contact Public Safety at 707-476-4112 or security@redwoods.edu if you have any questions. For more information see the Redwoods Public Safety Page.

In an emergency that requires an evacuation of the building anywhere in the District:

- Be aware of all marked exits from your area and building
- Once outside, move to the nearest evacuation point outside your building
- Keep streets and walkways clear for emergency vehicles and personnel

Do not leave campus, unless it has been deemed safe by the campus authorities.

Eureka Campus Emergency Procedures

Please review the campus emergency map for evacuation sites, including the closest site to this classroom (posted by the exit of each room). For more information on Public Safety go to the Redwoods Public Safety Page It is the responsibility of College of the Redwoods to protect life and property from the effects of emergency situations within its own jurisdiction.

In the event of an emergency:

1. Evaluate the impact the emergency has on your activity/operation and take appropriate action.
2. Dial 911, to notify local agency support such as law enforcement or fire services.

3. Notify Public Safety 707-476-4111 and inform them of the situation, with as much relevant information as possible.
4. Public Safety shall relay threat information, warnings, and alerts through the Everbridge emergency alert system, Public address system, and when possible, updates on the college website, to ensure the school community is notified.
5. Follow established procedures for the specific emergency as outlined in the College of the Redwoods Emergency Procedure Booklet, (evacuation to a safe zone, shelter in place, lockdown, assist others if possible, cooperate with First Responders, etc.).
6. If safe to do so, notify key administrators, departments, and personnel.
7. Do not leave campus, unless it is necessary to preserve life and/or has been deemed safe by the person in command.

Student Support Services

The following online resources are available to support your success as a student:

- CR-Online (Comprehensive information for online students)
- Library Articles & Databases
- Canvas help and tutorials
- Online Student Handbook

Counseling offers assistance to students in need of professional counseling services such as crisis counseling.

Learning Resource Center includes the following resources for students

- Academic Support Center for instructional support, tutoring, learning resources, and proctored exams. Includes the Math Lab & Drop-in Writing Center
- Library Services to promote information literacy and provide organized information resources.
- Multicultural & Diversity Center

Special programs are also available for eligible students include

- Extended Opportunity Programs & Services (EOPS) provides financial assistance, support and encouragement for eligible income disadvantaged students at all CR locations.
- The TRiO Student Success Program provides eligible students with a variety of services including trips to 4-year universities, career assessments, and peer mentoring. Students can apply for the program in Eureka or in Del Norte
- The Veteran's Resource Center supports and facilitates academic success for Active Duty Military, Veterans and Dependents attending CR through relational advising, mentorship, transitional assistance, and coordination of military and Veteran-specific resources.

Tips for Students

ASE-Certified Master Technicians were surveyed for their advice to students who want to become automotive service professional. Although the survey was especially for students, the tips that were suggested are applicable to all automotive technicians, from the newest to the most experienced. The following is a compilation of the responses:

1 Education, Education, Education – Continue your education and develop strong math, reading, study skills and computer skills. **A strong background in electronics is beneficial**.
2 Take advantage of on-the-job training, apprenticeship opportunities – Get all the training you can and start in a work environment that caters to service and excellence.
3 Keep abreast of new technology – Make a commitment to life-long learning. There is a constant change in technology so take advantage of additional training whenever it is available.

4 Learn a systems approach – Vehicles today are complex, so it is necessary to understand the interaction of electrical and mechanical components within the total system. Learn how to understand the whole system and you can apply this knowledge across the spectrum of vehicles.
5 Develop good communication skills – learn not only the professional and technical skills but also communication and people skills. Your credibility is linked to your perceived competence.
6 Keep a positive attitude – Develop a positive outlook so that you perform proper repairs. Apply yourself – you get exactly as much out of your job as you put into it.
7 Take pride in your work – Work on every car as if it were your own. Whatever you do – do it well, it's your signature.
8 Be honest and ethical – Stay focused on what is most important, practice good work ethics, be dependable and honest, and fix it right the first time.
9 Cultivate professionalism in yourself and others – Act professionally, take pride in your appearance as well as in the shop area. Be a positive role model for others. Show up for work every day and always be on time.
10 Become ASE certified – Certification gives you an edge when you are seeking employment. Your confidence, sense of self-worth, and ability to get a job almost anywhere are improved once you become certified. ASE certification shows your employer that you have proven your technical expertise and that you are among the group of the very best technicians.

Learning Outcomes

The college strives for continual improvement in instruction through assessment of learning outcomes. These outcomes are assessed in various ways throughout the course and upon completion of the program. Please participate to the fullest of your ability in this effort to make this course and this program successful.

Program Learning Outcomes

1. Perform common service and repair tasks identified by the National Automotive Technicians Education Foundation (NATEF)/ Automotive Service Excellence (ASE).
2. Locate industry-standard diagnostic information to localize complex automotive problems.
3. Successfully perform the entry level skills and tasks required for service and repair of automotive systems.

Course Objectives

For every task, the following safety requirements must be strictly enforced:

Compliance with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, proper ventilation, and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Upon successful completion of this course the student should be familiar with the following tasks:

General Drive Train Diagnosis
Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
Identify and interpret drive train concern; determine necessary action. P-1
Research applicable vehicle and service information, such as drive train system operation, fluid type, vehicle service history, service precautions, and technical service bulletins. P-1

Locate and interpret vehicle and major component identification numbers. P-1
Diagnose fluid loss, level, and condition concerns; determine necessary action. P-1
Drain and fill manual transmission/transaxle and final drive unit. P-1

Clutch Diagnosis and Repair
Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action. P-1
Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action. P-1
Inspect hydraulic clutch slave and master cylinders, lines, and hoses; determine necessary action. P-1
Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable). P-1
Bleed clutch hydraulic system. P-1
Inspect flywheel and ring gear for wear and cracks, determine necessary action. P-1
Inspect engine block, core plugs, rear main engine oil seal, clutch (bell) housing transmission/transaxle case mating surfaces, and alignment dowels; determine necessary action. P-1
Measure flywheel runout and crankshaft end play; determine necessary action. P-2

Transmission/Transaxle Diagnosis and Repair
Remove and reinstall transmission/transaxle. P-1
Disassemble, clean, and reassemble transmission/transaxle components. P-1
Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents; perform necessary action. P-2
Diagnose noise concerns using transmission/transaxle power flow principles. P-2
Diagnose hard shifting and jumping out of gear concerns; determine necessary action. P-2
Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers. P-2
Inspect, replace, and align powertrain mounts. P-2
Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces. P-2
Remove and replace transaxle final drive. P-3
Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs. P-2
Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action. P-1
Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings. P-1
Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action. P-3
Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly. P-3
Inspect lubrication devices (oil pump or slingers); perform necessary action. P-3
Inspect, test, and replace transmission/transaxle sensors and switches. P-2
Describe the operational characteristics of an electronically controlled manual transmission/transaxle. P-3

Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair
Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action. P-1
Diagnose universal joint noise and vibration concerns; perform necessary action. P-2
Remove and replace front wheel drive (FWD) front wheel bearing. P-1
Inspect, service, and replace shafts, yokes, boots, and CV joints. P-1
Inspect, service, and replace shaft center support bearings. P-3
Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. P-2

Drive Axle Diagnosis and Repair
Diagnose noise and vibration concerns; determine necessary action. P-2
Diagnose fluid leakage concerns; determine necessary action. P-1
Inspect and replace companion flange and pinion seal; measure companion flange runout. P-2
Inspect ring gear and measure runout; determine necessary action. P-2
Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings. P-2
Measure and adjust drive pinion depth. P-2
Measure and adjust drive pinion bearing preload. P-2
Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types). P-2
Check ring and pinion tooth contact patterns; perform necessary action. P-1
Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. P-2
Reassemble and reinstall differential case assembly; measure runout; determine necessary action. P-2

Limited Slip Differential
Diagnose noise, slippage, and chatter concerns; determine necessary action. P-3
Clean and inspect differential housing; refill with correct lubricant and/or additive. P-2
Inspect and reinstall limited slip differential components. P-3
Measure rotating torque; determine necessary action. P-3

Drive Axle Shaft
Diagnose rear axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine necessary action. P-2
Inspect and replace drive axle shaft wheel studs. P-1
Remove and replace drive axle shafts. P-1
Inspect and replace drive axle shaft seals, bearings, and retainers. P-2
Measure drive axle flange runout and shaft end play; determine necessary action. P-2

Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair
Diagnose noise, vibration, and unusual steering concerns; determine necessary action. P-3
Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. P-3
Remove and reinstall transfer case. P-3
Disassemble, service, and reassemble transfer case and components. P-3
Inspect front-wheel bearings and locking hubs; perform necessary action. P-3
Check drive assembly seals and vents; check lube level. P-3
Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems. P-3
Identify concerns related to variations in tire circumference and/or final drive ratios. P-3

AT 14
Course Grading System

Theory Portion

Test I Powertrain Basics	60 points
Test II FWD & RWD Shafts, Joints, & Service	60 points
Test III Clutches & Clutch Service	60 points
Test IV Manual Transmissions & Transaxles	60 points
Test V RWD Axle Assemblies	60 points
Assignments	100 points
Final Exam Comprehensive	100 points
Total possible Points	500 points

Extra Credit

Each student may elect independently to read and report on a topic related to manual transmissions from a source other than the course text i.e. trade publications, library reference material, magazines, newspaper articles, etc... The report must be no less than one page typed and no longer than three pages typed. You must properly cite your references on a separate page. You may earn up to 50 points per report and you may turn in a maximum of 1 report per semester. Please inform the instructor of your topic prior to doing this assignment.

Laboratory Portion

Includes proper documentation on a Repair Order (RO)

Diagnose: half-shaft, run out, and balance problems, remove and reinstall, replace cv joint and boot, and lube properly. Measure drive-shaft runout, check balance, R&R U-joint, measure driveline angles, R&R driveshaft.	100 points
Remove transmission/transaxle R&R and inspect clutch, flywheel, bell housing, and crankshaft endplay; Reinstall transmission/transaxle.	125 points
Disassemble, inspect, measure clearances, adjust, clean, and identify components; determine necessary action and reassemble a manual transmission.	100 points
Disassemble, inspect, measure clearances, adjust, clean, and identify components; determine necessary action and reassemble a manual transaxle.	75 points
Disassemble RWD axle assembly, inspect, clean, measure runout, adjust backlash and pinion depth as necessary and reassemble.	100 points
Total Possible Lab Points	500 points

Calendar

	Topic or Focus/Shop Lab	Text Chapters
8/23	Orientation & Shop Safety	Ch 1, 2, 3
8/25	Orientation & Shop Safety	Ch 1, 2, 3
8/30	Drivetrain Fundamentals & Drivetrain types	Ch 1, 2, 3
9/1	Drivetrain Fundamentals & Drivetrain types	Ch 1, 2, 3
9/6	**Test I & Shop Mixed Lab**	
9/8	FWD Axle Service	Ch 5
9/13	FWD Axle Service	Ch 5
9/15	RWD Drive Shaft Service	Ch 5
9/20	RWD Drive Shaft Service	Ch 5
9/22	**Test II & Shop Mixed Lab**	
9/27	Clutches Service & Trans R&R	Ch 6, 7
9/29	Clutches Service & Trans R&R	Ch 6, 7
10/4	Clutches Service & Trans R&R	Ch 6, 7
10/6	Clutches Service & Trans R&R	Ch 6, 7
10/11	Clutches Service & Trans R&R	Ch 6, 7
10/13	Clutches Service & Trans R&R	Ch 6, 7
10/18	Clutches & Service & Trans R&R	Ch 6, 7
10/20	Clutches & Service & Trans R&R	Ch 6, 7
10/25	**Test III & Shop Mixed Lab**	
10/27	RWD Transmission Service & Disassembly	Ch 4, 12, 13
11/1	RWD Transmission Service & Disassembly	Ch 4, 12, 13
11/3	RWD Transmission Service & Disassembly	Ch 4, 12, 13
11/8	RWD Transmission Service & Disassembly	Ch 4, 12, 13
11/10	FWD Transaxle Service & Disassembly	Ch 4, 12, 14
11/15	FWD Transaxle Service & Disassembly	Ch 4, 12, 14
11/17	**Test IV & Shop Mixed Lab**	
11/22	No Class	
11/24	No Class	
11/29	RWD Axles Service & Disassembly	Ch 8, 9
12/1	RWD Axles Service & Disassembly	Ch 8, 9
12/6	Review/Open Lab	
12/8	**Test V & Shop Mixed Lab**	
12/13	**Comprehensive Final**	