Syllabus for AT-24

Course Information

Semester & Year: Fall 2022
Course ID & Section #: AT-24-E3725 Engine Performance
Instructor's name: Anibal Florez
Day/Time of required meetings: Mondays and Wednesdays at 1:15pm – 5:35pm
Location: Lecture room AT-128, Automotive shop AT-129
Course units: 4

Instructor Contact Information

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

Catalog Description

A course covering theory and principles of engine performance related topics. Topics will include the internal combustion process, compression ratios, combustion efficiency, volumetric efficiency, airflow requirements, air-fuel ratios, fuel delivery systems, manifolds, electronic distributor ignition systems, oscilloscope waveform interpretation, ignition timing and advance strategies. The laboratory portion of the course will focus on diagnosis and repair of the following engine performance related problems, mechanical problems, computerized engine control systems, ignition systems, fuel delivery systems, and emission systems. The course is designed in conjunction with Automotive Service Excellence (ASE) standards and subsequently will in part prepare the student for the ASE Engine Performance Certification Examination.

Course Student Learning Outcomes

1. Perform general engine diagnosis

2. Diagnose and repair computerized engine controls

3. Diagnose and repair emission control systems

Prerequisites/co-requisites/ recommended preparation

There is no specific prerequisite or preparation for this class.

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

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.

Textbook information

Title & Edition: Automotive Engine Performance, 5th Ed.

Author: James Halderman

ISBN-13: 978-0-130407491-7

Technology

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, and possibly communicating with your instructor as well as other students. This is in addition to our time together in both the lecture room and shop.

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

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 (People! - 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 being able to do your homework on-line 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 withing a couple of business days.
- My general availability – Office hours by appointment, email and phone anytime.
    - I prefer emails but you can call my office anytime. Emails are usually the better way.
- Come on by! Even if its outside of any 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 online 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 person its proper etiquette 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 your time. A typical class will require about nine hours per week of your time. You will need to carefully listen to lectures and carefully read textbook chapters, participate in both classroom and shop activities, complete quizzes and tests including the final exam. Conscientiousness, attention to details, and skills in reading and writing are critical for success in any endeavor.

Student Expectations of Instructor

I prepare weekly classroom and shop activities. I will access the class website regularly and respond to posted questions and messages. Additionally, I read every chapter I assign and expect a discussion from your questions in class the next day we meet. There is also regular instructor-based communication via announcements, lectures, feedback to any discussion posts, completed labs, homework, and email/message students who fall behind.

Support for online learners during COVID-19

In response to COVID-19, College of the Redwoods moved to protect the health and safety of our students and staff. 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 and tests – Read assigned chapters prior to coming to class.
2. Access to the internet to actively participate in online assignments.
3. Actively participate in shop assignments while striving for improvement.
4. Refrain from using personal electronic devices unless it pertains to the class.
5. Must use safety glasses.

6. Everyone will comply with the latest COVID-19 Social Distancing and Safety Guidelines.
7. 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 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 Monday and Wednesday afternoons at 1:15pm and will conclude at 5:35pm. During our allotted time we will go over assigned textbook material, work through classroom review exercises and finally discuss shop activities and conclude with hands-on application in the shop.

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 essential**.
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

Upon successful completion of this course the student should be able to perform the following tasks:

A. General Engine Diagnosis

1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1
2. Identify and interpret engine performance concern; determine necessary action. P-1
3. Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins. P-1
4. Locate and interpret vehicle and major component identification numbers. P-1
5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. P-2
6. Diagnose abnormal engine noise or vibration concerns; determine necessary action. P-3
7. Diagnose abnormal exhaust color, odor, and sound; determine necessary action. P-1
8. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. P-1
9. Perform cylinder power balance test; determine necessary action. P-2
10. Perform cylinder cranking and running compression tests; determine necessary action. P-1
11. Perform cylinder leakage test; determine necessary action. P-1
12. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action. P-1
13. Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action. P-3
14. Verify engine operating temperature; determine necessary action. P-1
15. Verify correct camshaft timing. P-1

B. Computerized Engine Controls Diagnosis and Repair

1. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. P-1
2. Diagnose the causes of emissions or drivability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data. P-1
3. Diagnose emissions or drivability concerns without stored diagnostic trouble codes; determine necessary action. P-1
4. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action. P-1
5. Access and use service information to perform step-by-step diagnosis. P-1

C. Ignition System Diagnosis and Repair

1. Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark

knock, power loss, poor mileage, and emissions concerns; determine necessary action. P-1

1. Inspect and test ignition primary and secondary circuit wiring and solid state components; test ignition coil(s); perform necessary action. P-1
2. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action. P-1
3. Inspect, test, and/or replace ignition control module; powertrain/engine control module; reprogram as necessary. P-2

D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

1. Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action. P-1
2. Check fuel for contaminants and quality; determine necessary action. P-2
3. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action. P-1
4. Replace fuel filters. P-2
5. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air. P-2
6. Inspect and test fuel injectors. P-1
7. Verify idle control operation. P-1
8. Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action. P-1
9. Perform exhaust system back-pressure test; determine necessary action. P-1

E. Emissions Control Systems Diagnosis and Repair

1. Diagnose oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. P-2
2. Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. P-2
3. Diagnose emissions and drivability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action. P-1
4. Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action. P-1
5. Diagnose emissions and drivability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action. P-2
6. Diagnose emissions and drivability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action. P-2
7. Inspect and test mechanical components of secondary air injection systems; perform necessary action. P-3
8. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action. P-3
9. Inspect and test catalytic converter efficiency. P-1
10. Diagnose emissions and drivability concerns caused by the evaporative emissions control system; determine necessary action. P-1
11. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action. P-1
12. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action. P-1

F. Engine Related Service

1. Adjust valves on engines with mechanical or hydraulic lifters. P-1
2. Remove and replace timing belt; verify correct camshaft timing. P-1

Evaluation & Grading Policy

Test I	Engine Theory & Fuel Delivery	70 points
Test II	Ignition System & Scope Testing	70 points
Test III	Emission Systems & 5 Gas Analysis	70 points
Test IV	Engine Control Systems	70 points
Quizzes & Assignments		100 points
Final Exam Comprehensive		120 points
Total Lecture Points		500 points

Extra Credit

Each student may arrange with instructor to read and report on a topic related to AT 24 Engine Performance from a source other than the course text or the internet 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. 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 and agree on a topic prior to doing this assignment.

Laboratory Portion

Module 1 – Engine Testing and Fuel Delivery	125 points
Module 2 – Ignition Systems, Mechanical and Ignition Timing	125 points
Module 3 – Sensor Diagnosis and On-Board Diagnostics	125 points
Module 4 – Emission Control Systems	125 points
Total Laboratory Points	500 points

Course Calendar for AT-24 Engine Performance

Date	Theory in Class	Shop Focus	Chp. To Read
8-22	Overview	Shop Safety	Ch. 1, 2
8-24	Engine Basics	Engine Testing	Ch. 3, 13
8-29	Air/Fuel Theory	Engine Testing	Ch. 13, 14
8-31	Fuel Delivery	Fuel System Service	Ch. 26
9-5	**Holiday**		
9-7	Fuel Delivery	Fuel System Tests	Ch. 26
9-12	Fuel Injection	Injection Service	Ch. 27, 28
9-14	Fuel Injection	Injection Service	Ch. 27, 28
9-19	Fuel Injection	Injection Testing	Ch. 30
9-21	**Test I Engine Theory & Fuel Injection**		
9-26	Ignition Basics	Ignition Primary Tests	Ch. 11, 16, 17
9-28	Ignition Secondary	Secondary Tests	Ch. 11, 16, 17
10-3	Ignition Timing	Timing	Ch. 11, 16, 17
10-5	Mechanical Timing	Base Timing Inspection	Handout
10-10	Oscilloscope Waveform Interpretation		Handout
10-12	**Test II Ignition Systems & Scope Testing**		
10-17	Scan Tool Diagnostics		Ch. 33
10-19	Scan Tool Diagnostics		Ch. 33
10-24	On-Board Diagnostics		Ch. 18, 19
10-26	On-Board Diagnostics		Ch. 18, 19
10-31	ECT & TPS	Sensor Diagnosis	Ch. 20, 21, 29
11-2	MAP/BARO MAF	Sensor Diagnosis	Ch. 22, 23

11-7	O2S/HO2S	Sensor Diagnosis	Ch. 24, 25
11-9	**Test III Basic Computer Control System Testing**		
11-14	Evap System	Evap Testing	Ch. 31, 32
11-16	PCVAIR System	PCV/AIR Service	Ch. 31, 32
11-21	***Fall Break***		
11-23	***Fall Break***		
11-28	EGR System	EGR Testing	Ch. 31, 32
11-30	5 Gas Analysis	5 Gas Testing	Ch. 31, 32
12-5	Catalytic Converter	CAT Testing	Ch. 31, 32
12-7	**Test IV Emission Systems & 5 Gas Analysis**		
12-14	**Final Exam**		