

**Odessa College
Technical Studies Division
Automotive Technology**

Course Syllabus

COURSE NUMBER: AUMT 2434
COURSE TITLE: Engine Performance Analysis II
CREDIT HOURS: 4 **LECTURE HOURS:** 2 **LAB HOURS:** 6
PREREQUISITE: AUMT 2417 and AUMT 2437, consent of department chair or instructor .

CATALOG DESCRIPTION:

Introduces fundamentals of solid state devices such as FET, bipolar and uni-junction transistors, the students will better understand LED's, solid state regulators, electronic spark control timing, amplifiers, buffers, SCR's, RAMS, PROMS, and EPROM. The automotive computer technologies will also be introduced. Students in lab exercises, working in teams, will develop thinking and reasoning abilities useful in diagnosing automotive electronic problems. The reading of technical materials is required. Diagnosis and repair of emission systems, computerized engine performance systems, and advanced ignition and fuel systems; and proper use of advanced engine performance diagnostic equipment. May be taught manufacturer specific. **Capstone course.** Lab fee required. (SCANS 1, 2, 3, 5, 6, 7, 8, 9, 10, 11)
Prerequisite: AUMT 2417 and AUMT 2437 and/or consent of department chair or instructor.

COURSE LEARNING OUTCOMES:

Explain the difference between conductors, insulators and semiconductors; measure electrical values in series and parallel circuits; study the use of electronic components to include resistors, diodes, transistors, and capacitors; interpret the use of sensors, microcomputers and outputs; and implement test equipment to diagnose vehicle faults related to electrical and electronic systems.

COMPETENCIES:

After completing this course, the student should be able to demonstrate automotive competency in:

VIII. ENGINE PERFORMANCE

TEXTBOOK

Classroom Manual: Automotive Engine Performance, Ken Pickerill, 4th Edition, Thomson Delmar Learning, 2006
Shop Manual: Automotive Engine Performance, Ken Pickerill, 4th Edition, Thomson Delmar Learning, 2006

SUPPLIES:

Students will need course textbook, job sheets, paper, notebook, pen and pencils.

COURSE GRADE EVALUATION:

25% Professionalism (*A grade will be assessed using the following guide lines.*)
Punctuality
Desire to learn
Appropriate appearance
Quality workmanship
Ability to work with others
Safe working habits (*Students will be graded in all areas of shop safety.*)
Positive attitude
Work ethics
Integrity
Attendance
25% Research Paper and/or Final Exam
25% Lab Participation
25% Quizzes and/or Daily Task (*Quizzes maybe verbal/written*)

Also see instructor information sheet:

ATTENDANCE POLICY:

Students are expected to attend all classes in which they are enrolled. The college requires instructors to keep accurate student attendance records; therefore, any student who must be absent from class for any reason should immediately consult with his/her instructor regarding the absence. **YOUR** attendance is the greatest predictor of your success. **Student attendance at EVERY class is expected.** You should expect that each absence will adversely affect your course grade. (*For more information, refer to the catalog section; Academic and Class Information, currently on page 42 in the 2009-2011 catalog.*)

ACADEMIC ETHICS:

You are expected to participate and contribute as a group in the labs and classroom; test will be taken without notes or other outside-assistance. If unethical behavior is detected, all parties involved will be denied credit for that project or exam. The questioned material and report of the ethics violation will be submitted to the department chair for further action if deemed necessary.

STUDENT ASSISTANCE:

- Admissions: 432-335-6432
- Auto/Diesel Department Chair: 432-335-6633
- Book Store: 432-335-6655
- Cafeteria: 432-335-6435
- Career Services: 432-335-6433
- Cashier's: 432-335-6419
- Counseling: (Help center) 432-335-6433
- Rosie Aguilar 432-335-6741
- Dollars for Scholars 432-335-6648
- .edu: (Student Service Center) 432-335-6894
- Financial Services: 432-335-6429
- Housing/Judicial Affairs: 432-335-6300
- Learning Resources Center: 432-335-6640
- Office of Disability Services 432-335-6861

What a student with a documented disability must do to obtain services

A student with a documented disability planning to attend classes and needing to request accommodations must present the appropriate documentation to the Office of Disability Services, located in the Student Union Building/ Help Center. It is recommended that the student meet with the Special Populations advisor three weeks prior to the beginning of the semester to make the necessary arrangements for the needed accommodations. Please call Becky at 335-6861 or send an email to brivera@odessa.edu for additional information or to make an appointment.

- Phi Theta Kappa 432-335-6533
- Registrar: 432-335-6404
- Sports Center 432-335-6476
- Student Learning Center:
 - Peer tutoring available
 - PLATO: Computer tutoring available
 - (LRC 300) 432-335-6673
- Student Support Services: 432-335-6476
- Technical Studies Dean: 432-335-6686
- Testing Center: 432-335-6620
- Vice President Instruction: 432-335-6413
- Vice President for Student Services:
 - 432-335-6684
- Wi-Fi Java, Cyber Café: 432-335-6891
- Wrangler Express Center 432-335-6849

FACULTY:

James McCutcheon, chair;	Office Dm102	432-335-6633	jmccutcheon@odessa.edu
Jerry Griffith	Office Dm101	432-335-6632	jgriffith@odessa.edu
Perry Griffith	Office Dm105A	432-335-6603	pgriffith@odessa.edu

LAB REQUIREMENTS:

General Shop Practices and Procedures

- **Safety requirements will be strictly enforced: comply 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 in accordance with local, state, and federal environmental regulations.**
- Proper **Personal Protection Equipment (PPE)** will be used in all required areas.
- **Safety Glasses** must be worn **at all times** in the **lab/shop area**. No exceptions!
- **Adhere to all Safety signs** posted on equipment, fire extinguishers, tool groups, vehicle lifts, support stands, grinders, drill presses, or any other equipment or areas marked with Safety signage.
- Do not restrict the passage of any marked walkway.
- **Safety is paramount** and you are responsible for your work area and your safe work habits! **Therefore, do not leave fluid spills on floor and keep your area free of clutter!**
- Equipment use is limited to those knowledgeable enough to operate the equipment safely; otherwise the equipment is **OFF LIMITS! (Consult your instructor).**
- Tools and equipment **will not be loaned** or taken from the Odessa College premises.
- Students **MUST** sign out for any specialty tool needed and will only be issued by an instructor or designated person. The student will be **responsible for safety and care of those tools, when finished or at the end of each lab period**, return all tools to the checkout person so they can sign the tool back in.
- NATEF job sheets will be filled out for each lab assignment. When finished, give completed job sheets to the instructor and those will be recorded on your progress report.
- All vehicles are to be treated as customer vehicles. As a student **YOU ARE TO RESPECT THIS**, do not sit in, lean on, or handle any vehicle that has not been specifically assigned to you by your instructor.
- Any time a vehicle hood is open, fender covers must be in place on the fenders at all times.
- Students must get approval from the instructor **before** bringing vehicles in the shop. **Only certain vehicles qualify for NATEF required tasks.**
- Visitors are not allowed in the lab/shop area, however they may be escorted through the lab/shop area by approved personal.

COURSE COMPETENCIES:

NATEF RECOMMENDED TASKS FOR AUTOMOTIVE TECHNOLOGY

ENGINE PERFORMANCE

For every tasks in Engine Performance, the following safety requirement must be strictly enforced as a number 1 priority: Comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and handling, storage and disposal of chemicals in accordance with local, state, and federal safety and environmental regulations, listen to and verify the operator's concern, review past maintenance and repair documents, and determine necessary action.

VIII. ENGINE PERFORMANCE

VIII.A General Engine Diagnosis

Task	Job Sheet	Priority	
A.1	1	P1	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
A.2	2	P1	Identify and interpret engine performance concern; determine necessary action.
A.3	3	P1	Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins.
A.4	4	P1	Locate & interpret vehicle major component identification number VIN vehicle certification label & calibration decals
A.5	2	P2	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
A.6	2	P2	Diagnose abnormal engine noise or vibration concerns; determine necessary action.
A.7	2	P2	Diagnose unusual exhaust color, odor, and sound; determine necessary action.
A.8	5	P1	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
A.9	6	P1	Perform cylinder power balance test; determine necessary action.
A.10	7	P1	Perform cylinder cranking compression test; determine necessary action.
A.11	8	P1	Perform engine running compression test; determine necessary action.
A.12	9	P1	Perform cylinder leakage test; determine necessary action.
A.13	10	P1	Diagnose engine mechanical, electrical, electronic, fuel and ignition problems with an oscilloscope and engine diagnostic equipment; determine necessary action.
A.14	11	P1	Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings and determine necessary action.
A.15	12	P1	Verify engine operating temperature; determine necessary action.
A.16	13	P1	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.
A.17	14	P2	Verify correct camshaft timing.

VIII.B Computerized Engine Controls Diagnosis and Repair

B.1	15	P3	Retrieve and record stored OBD I diagnostic trouble codes; clear codes.
B.2	16	P1	Retrieve and record stored OBD II diagnostic trouble codes; clear codes when applicable.
B.3	17	P1	Diagnose the causes of emissions or drive ability concerns resulting from malfunctions in the computerized engine controls with stored diagnostic trouble codes.
B.4	18	P1	Diagnose emissions or drive ability concerns resulting from failure of computerized engine controls with no stored diagnostic trouble codes; determine necessary action.
B.5	19	P2	Check for module communication (including CAN/BUS systems) errors using a scan tool.
B.6	20	P1	Inspect and test computerized engine control system sensors, power train control module(PCM), actuators, and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO); perform necessary action.
B.7	19	P1	Obtain and interpret scan tool data.
B.8	21	P1	Access and use service information to perform step-by-step diagnosis.
B.9	22,23,24	P3	Diagnose drivability and emissions problems resulting from failures of interrelated systems (cruise control, security alarms, torque controls, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories or similar systems); determine necessary action.
B.10	25	P1	Perform active tests of actuators using scan tool; determine necessary action.

VIII.C Ignition System diagnosis and Repair

C.1	26	P1	Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drive ability, spark knock, power loss, poor mileage, & emissions concerns on vehicles with electronic ignition systems; determine necessary action.
C.2	26	P1	Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor drive ability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with distributor ignition systems; determine necessary action.
C.3	27,28	P2	Inspect and test ignition primary circuit wiring and solid state components; perform necessary action.
C.4	28	P3	Inspect, test, and service distributor.
C.5	28	P2	Inspect and test ignition system secondary circuit wiring and components; perform necessary action.
C.6	29	P1	Inspect and test ignition coil(s); perform necessary action.
C.7	30	P3	Check and adjust ignition system timing and timing advance/retard(where applicable).
C.8	27,28	P1	Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action.

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

Task	Job	Priority
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Sheet

D.1	31,32	P1	Diagnose hot or cold no-starting, hard starting, poor drive ability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems; determine necessary action.
D.2	33	P3	Check fuel for contaminants and quality; determine necessary action.
D.3	34,35,42	P1	Inspect and test mechanical and electrical fuel pumps and pump control systems for pressure, regulation and volume; perform necessary action.
D.4	36	P1	Replace Fuel filters.
D.5	37	P3	Inspect and test cold enrichment system components; perform necessary action.
D.6	38,40	P2	Inspect throttle body; air induction system, intake manifold and gaskets for vacuum leaks and/or unmetred air.
D.7	39	P1	Inspect, test and clean fuel injectors.
D.8	41	P2	Check idle speed.
D.9	43	P2	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.
D.10	44	P1	Perform exhaust system back-pressure test; determine necessary action.
D.11	45	P3	Test the operation of turbocharger /supercharger systems; determine necessary action.

VIII.E Emissions Control Systems Diagnosis and Repair

VIII.E.1 Positive Crankcase Ventilation

E.1.1	46	P2	Diagnose oil leaks, emissions, and drivability problems resulting from malfunctions in the positive crankcase ventilation (PCV) system; determine necessary action.
E.1.2	46	P2	Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.

VIII.E.2 Exhaust Gas Recirculation

E.2.1	47	P1	Diagnose emissions and drive ability problems caused by malfunctions in the exhaust gas recirculation (EGR) system; determine necessary action.
E.2.2	47	P1	Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action.
E.2.3	47	P2	Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.

VIII.E.3 Exhaust Gas Treatment

E.3.1	44	P2	Diagnose emissions and drive ability problems resulting from malfunctions in the secondary air injection and catalytic converter systems; determine necessary action.
E.3.2	48	P3	Inspect and test mechanical components of secondary air injection systems; perform necessary action.
E.3.3	48	P3	Inspect & test electrical/electronically operated components & circuits of air injection systems perform necessary action
E.3.4	44	P1	Inspect and test catalytic converter performance.

VIII.E.4 Evaporative Emissions Controls

E.4.1	49	P1	Diagnose emissions and drive ability problems resulting from malfunctions in evaporative emissions control system; determine necessary action.
E.4.2	49	P2	Inspect and test components and hoses of evaporative emissions control system; perform necessary action.
E.4.3	49	P1	Interpret evaporative emission related diagnostic trouble codes (DTCs); determine necessary action.

VIII.F Engine Related Service

F.1	50	P1	Adjust valves on engines with mechanical or hydraulic lifters.
F.2	51	P1	Remove and replace timing belt; verify correct camshaft timing.
F.3	52	P1	Remove and replace thermostat and gasket.
F.4	53	P1	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.
F.5	54	P1	Perform common fastener and thread repair to include, remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
F.6	55	P1	Perform oil and filter changes.
F.7	56	P3	Demonstrate proficiency in using oxy-acetylene torch to heat and cut metal.
F.8	57	P3	Identify hybrid internal combustion engine service precautions.