

**Odessa College
Technical Studies Division
Automotive Technology**

Course Syllabus

COURSE NUMBER: AUMT 2417

COURSE TITLE: Engine Performance Analysis I

CREDIT HOURS: 4 **LECTURE HOURS:** 2 **LAB HOURS:** 6

PREREQUISITE: DEMR 1405, consent of department chair or instructor , Co requisite: AUMT 1419

CATALOG DESCRIPTION:

Theory, operation, diagnosis, and repair of basic dynamics, ignition systems, and fuel delivery systems. Use of basic engine performance diagnostic equipment. May be taught manufacturer specific. Lab fee required. (SCANS 1, 2, 3, 4, 5, 6, 7, 8, 10, 11)
Prerequisite: Consent of department chair or instructor. Co requisite: AUMT 1419.

COURSE LEARNING OUTCOMES:

Utilize appropriate safety procedures; explain engine dynamics; diagnose and repair ignition systems and fuel delivery systems; and demonstrate the proper use of basic engine performance diagnostic equipment.

COMPETENCIES:

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

- I. AUTOMOTIVE ENGINES**
- VIII. ENGINE PERFORMANCE**

TEXTBOOK

Shop Manual: Automotive Engine Repair & Rebuilding, Elisabeth H. Dorries, 3rd 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

Also see instructor information sheet:

ATTENDANCE POLICY:

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. Please see the instructor regarding anticipated absences or conflicts due to college sponsored activities.

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: 432-335-6443
- Book Store: 432-335-6654
- Cafeteria: 432-335-6435
- Career Services: 432-335-6835
- Cashier's: 432-335-6600
- Counseling: (Help center) 432-335-6346
- Auto/Diesel Department Chair: 432-335-6633
- .edu: (Student Service Center) 432-335-6833
- Financial Services: 432-335-6429
- Housing/Judicial Affairs: 432-335-6300
- Learning Resources Center: 432-335-6641
- Registrar: 432-335-6443
- Student Learning Center:
 - Peer tutoring available
 - PLATO: Computer tutoring available (LRC 300) 432-335-6878
- Student Support Services: 432-335-6868
- Technical Studies Dean: 432-335-6686
- Testing Center: 432-335-6834
- Vice President Instruction: 432-335-6413
- Vice President for Student Services:
 - 432-335-6683
- Wi-Fi Java, Cyber Café: 432-335-6509

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

AUTOMOTIVE ENGINES

For every task in Automotive Engine Repair, 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.

I. AUTOMOTIVE ENGINES (GENERAL ENGINE DIAGNOSIS; REMOVAL AND REINSTALLATION (R & R))

For every task in the Engine Repair category, the following task must be strictly enforced as a number 1 priority:

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 concern; determine necessary action.
A.3	3	P1	Research applicable vehicle and service information, such as internal engine operation, vehicle service history, service precautions, and technical service bulletins.
A.4	3	P1	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).
A.5	2	P1	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
A.6	2	P2	Diagnose engine noises and vibrations; determine necessary action.
A.7	2	P2	Diagnose the cause of excessive oil consumption unusual engine exhaust color odor, & sound determine necessary action
A.8	4	P1	Perform engine vacuum tests; determine necessary action.
A.9	5	P1	Perform cylinder power balance tests; determine necessary action.
A.10	6	P1	Perform cylinder cranking compression tests; determine necessary.
A.11	7	P1	Perform cylinder leakage tests, determine necessary action.
A.12	8,9,10,11	P2	Remove and reinstall engine in a front wheel or rear wheel drive vehicle (OBDII or newer); reconnect all attaching components and restore the vehicle to running condition.
A.13	12	P1	Install engine covers using gaskets, seals and sealers as required.

I.B CYLINDER HEAD AND VALVE TRAIN DIAGNOSIS AND REPAIR

B.1	13	P2	Remove and reinstall cylinder heads and gaskets; tighten according to manufacturer specifications and procedures.
B.2	13,14	P1	Visually inspect cylinder head for cracks; check gasket surface areas for warp age & leakage; check passage condition.
B.3	15	P3	Inspect valve springs for squareness and free height comparison; determine necessary action.
B.4	16,17	P2	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks, and valve grooves; determine necessary action.
B.5	18	P3	Inspect valve guides for wear; check valve stem-to-guide clearance; determine necessary action.
B.6	17,19,20	P3	Inspect valves and valve seats; determine necessary action.
B.7	21	P3	Check valve face-to-seat contact and valve seat concentricity (run out); determine necessary action.
B.8	22	P3	Check valve spring assembled height and valve stem height; determine necessary action.
B.9	23	P2	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action.
B.10	23	P2	Inspect hydraulic or mechanical lifters; determine necessary action.
B.11	24	P1	Adjust valves (mechanical or hydraulic lifters).
B.12	25	P2	Inspect camshaft drives. (including gear wear and backlash, sprocket and chain wear); determine necessary action.
B.13	26	P1	Inspect /replace timing chain, overhead cam drive sprockets, & tensioners; check belt/chain tension; adjust as necessary
B.14	27	P2	Inspect camshaft for run out, journal wear and lobe wear.
B.15	27	P3	Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine necessary action.
B.16	28	P1	Establish camshaft(s) timing and cam sensor indexing according to manufacturers specifications and procedures.

I.C ENGINE BLOCK ASSEMBLY DIAGNOSIS AND REPAIR

C.1	29,30	P2	Disassemble engine block; clean and prepare components for inspection and reassembly.
C.2	30	P2	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine necessary action.
C.3	31	P2	Perform common fastener and thread repair to include, remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
C.4	33	P2	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine necessary action.
C.5	34	P2	Deglaze and clean cylinder walls.
C.6	35	P3	Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine necessary action.
C.7	36,37	P2	Inspect crankshaft for end play, straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure journal wear; check crankshaft sensor reluctor ring (where applicable); determine necessary action.
C.8	38,39	P2	Inspect main and connecting rod bearings for damage and wear; determine necessary action.
C.9	40	P3	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine necessary action.
C.10	41	P2	Inspect and measure pistons; determine necessary action.
C.11	42	P3	Remove and replace piston pin.
C.12	41	P2	Inspect, measure, and install piston rings.
C.13	43	P2	Inspect auxiliary (balance, intermediate, idler, counterbalance, or silencer) shaft(s); inspect shafts and support bearings for damage and wear; determine necessary action; reinstall and time.
C.14	44	P3	Inspect, repair or replace crankshaft vibration damper (harmonic balancer).
C.15	44,45	P1	Assemble engine block assembly.

I.D LUBRICATION AND COOLING SYSTEMS DIAGNOSIS AND REPAIR

Task	Job Sheet	Priority	
I.D.1	46	P1	Perform oil pressure tests; determine necessary action.
I.D.2	47	P2	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive; perform necessary action.
I.D.3	48	P1	Perform cooling system, pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank and hoses; determine necessary action.
I.D.4	49	P1	Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment
I.D.5	50	P1	Inspect and replace engine cooling and heater system hoses.
I.D.6	51	P1	Inspect, test, and replace thermostat and gasket.
I.D.7	48	P1	Test coolant; drain and recover coolant; flush/refill cooling system with recommended coolant; bleed air as required.
I.D.8	52	P1	Inspect, test, remove, and replace water pump.
I.D.9	53	P2	Remove and replace radiator.
I.D.10	54	P1	Inspect, and test fan(s) (electrical or mechanical), fan clutch, and fan shroud, and air dams.
I.D.11	55	P3	Inspect auxiliary oil coolers; determine necessary action.
I.D.12	56	P2	Inspect, test, and replace oil temperature and pressure switches and sensors.
I.D.13	57	P1	Perform oil and filter change.

VIII.A General Engine Diagnosis

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

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.6	38,40	P2	Inspect throttle body; air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered 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.

VIII.E.1 Positive Crankcase Ventilation

E.1.2	46	P2	Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.
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VIII.E.2 Exhaust Gas Recirculation

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.
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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.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.

