

**Odessa College
Technical Studies Division
Automotive Technology**

Course Syllabus

COURSE NUMBER: AUMT 1405

COURSE TITLE: Introduction to Automotive Technology

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

PREREQUISITE: Consent of department chair or instructor.

CATALOG DESCRIPTION:

An introduction to the automotive industry including automotive history, safety practices, shop equipment and tools, vehicle subsystems, service publications, fasteners, professional responsibilities, and automotive maintenance. May be taught manufacturer specific. Lab fee required. (SCANS 1, 2, 3, 5, 6, 7, 8, 9, 10, 11) Prerequisite: Consent of department chair or instructor.

COURSE LEARNING OUTCOMES:

Utilize appropriate safety procedures; describe historical development and career information of the automotive industry; demonstrate safe, professional, and responsible work practices; demonstrate the proper use of shop equipment and tools; describe functions of vehicle subsystems; use service information; identify various automotive fasteners; and perform automotive maintenance..

COMPETENCIES:

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

VII. PREVENTIVE MAINTENANCE

I. AUTOMOTIVE ENGINES

IV. SUSPENSION AND STEERING

V. BRAKES

VI. ELECTRICAL/ ELECTRONIC SYSTEMS

VII. HEATING AND AIR CONDITIONING

TEXTBOOK

Classroom Manual: Automotive Air Conditioning by Boyce H. Dwiggin; 3rd edition

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 TECHNOLOGY

For every task in Automotive Technology, 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.

VII. PREVENTATIVE MAINTENANCE INSPECTION

All practices and procedures must be performed according current mandates, standards, and regulations.

VII.A Engine System

VII.A.1 Engine

| Task | Job Sheet | Priority | |
|-------|-----------|----------|--|
| A.1.1 | ? | P1 | Check engine starting/operation including unusual noises, Vibrations, exhaust smoke; record idle and governed rpm. |
| A.1.2 | | P1 | Inspect Vibration damper. |
| A.1.3 | | P1 | Inspect belts, tensioners, and pulleys; check and adjust belt tension; check belt alignment. |
| A.1.4 | | P1 | Check engine oil level; check engine for oil, coolant, and fuel leaks (Engine Off). |
| A.1.5 | | P1 | Inspect engine mounts for looseness and deterioration. |
| A.1.6 | | P1 | Check engine for oil, coolant, air, fuel, and exhaust leaks (Engine Running). |
| A.1.7 | | P1 | Check electrical wiring routing & hold-down clamp including Engine Control Module/Power train Control Module. |

VII.A.2 Fuel System

| | | | |
|-------|---|----|---|
| A.2.1 | ? | P1 | Check fuel tanks, mountings, lines, caps, and vents. |
| A.2.2 | | P1 | Inspect throttle linkages and return springs. |
| A.2.3 | | P1 | Drain water from fuel system. |
| A.2.4 | | P1 | Inspect water separator/fuel heater; replace fuel filter(s); prime and bleed fuel system. |

VII.A.3 Air Induction and Exhaust System

| | | | |
|-------|---|----|---|
| A.3.1 | ? | P1 | Check exhaust system mountings for looseness and damage. |
| A.3.2 | | P1 | Check engine exhaust system for leaks, proper routing, and damaged or missing components to include exhaust gas recirculation (EGR) system if equipped. |
| A.3.3 | | P1 | Check air induction system: piping, charge air cooler, hoses, clamps, & mountings; check for air restrictions and leaks. |
| A.3.4 | | P1 | Inspect turbocharger for leaks; check mountings and connections. |
| A.3.5 | | P1 | Check operation of engine compression/ exhaust brake. |
| A.3.6 | | P1 | Service or replace air filter as needed; check and reset air filter restriction indicator. |

VII.A.4 Cooling System

| | | | |
|-------|---|----|---|
| A.4.1 | ? | P1 | Check operation of fan clutch. |
| A.4.2 | | P1 | Inspect radiator (including air flow restriction, leaks, and damage) and mountings. |
| A.4.3 | | P1 | Inspect fan assembly and shroud. |
| A.4.4 | | P1 | Pressure test cooling system and radiator cap. |
| A.4.5 | | P1 | Inspect coolant hoses and clamps. |
| A.4.6 | | P1 | Inspect coolant recovery system. |
| A.4.7 | | P1 | Check coolant for contamination, supplemental coolant additives concentration, and protection level (freeze point). |
| A.4.8 | | P1 | Service coolant filter/conditioner. |
| A.4.9 | | P1 | Inspect water pump for leaks and bearing play. |

VII.A.5 Lubrication System

| | | | |
|-------|---|----|---|
| A.5.1 | ? | P1 | Change engine oil /filters; visually check oil for coolant or fuel contamination; inspect and clean magnetic drain plugs. |
| A.5.2 | | P1 | Take an engine oil sample. |

VII.B.1 Instruments and Controls

| | | | |
|-------|---|----|---|
| B.1.1 | ? | P1 | Inspect key condition and operation of ignition switch. |
| B.1.2 | | P1 | Check warning indicators. |
| B.1.3 | | P1 | Check instruments; record oil pressure and system voltage. |
| B.1.4 | | P1 | Check mechanical, electronic, and emergency shut down operation. |
| B.1.5 | | P1 | Check mechanical and electronic engine speed controls. |
| B.1.6 | | P1 | Check heater, ventilation, and air conditioning (HVAC) controls. |
| B.1.7 | | P1 | Check operation of all accessories. |
| B.1.8 | | P1 | Using diagnostic tool or on-board diagnostic system; extract engine monitoring information. |

VII.B.2 Safety Equipment

| | | | |
|-------|---|----|---|
| B.2.1 | ? | P1 | Check operation of electric/air horns and back-up warning devices. |
| B.2.2 | | P1 | Check condition and documentation of safety flares, spare fuses, triangles, fire extinguisher, and all required decals. |
| B.2.3 | | P1 | Inspect seat belts and sleeper restraints. |
| B.2.4 | | P1 | Inspect wiper blades and arms. |

VII.B.3 Hardware

| Task | Job Sheet | Priority | |
|--------|-----------|----------|--|
| B.3.1 | ? | P1 | Check wiper and washer operation. |
| B.3.2 | | P1 | Inspect windshield glass for cracks or discoloration; check sun visor. |
| B.3.3 | | P1 | Check seat condition, operation, and mounting. |
| B.3.4 | | P1 | Check door glass and window operation. |
| B.3.5 | | P1 | Inspect steps and grab handles. |
| B.3.6 | | P1 | Inspect mirrors, mountings, brackets, and glass. |
| B.3.7 | | P1 | Record all observed physical damage. |
| B.3.8 | | P1 | Lubricate all cab and hood grease fittings. |
| B.3.9 | | P1 | Inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables. |
| B.3.10 | | P1 | Inspect cab mountings, hinges, latches, linkages and ride height; service as needed. |
| B.3.11 | | P1 | Inspect tilt cab hydraulic pump, lines, and cylinders for leakage; inspect safety devices; service as needed. |

VII.B.4 Heating, Ventilation, & Air Conditioning (HVAC)

| | | | |
|-------|---|----|---|
| B.4.1 | ? | P1 | Inspect A/C condenser and lines for condition and visible leaks; check mountings. |
| B.4.2 | | P1 | Inspect A/C compressor and lines for condition and visible leaks; check mountings. |
| B.4.3 | | P1 | Check A/C system condition and operation; check A/C monitoring system, if applicable. |
| B.4.4 | | P1 | Check HVAC air inlet filters and ducts; service as needed. |

VII.C.1 Battery and Starting Systems

| | | | |
|-------|---|----|--|
| C.1.1 | ? | P1 | Inspect battery box (es), cover(s), and mountings. |
| C.1.2 | | P1 | Inspect battery hold-downs, connections, cables, and cable routing; service as needed. |
| C.1.3 | | P1 | Check/record battery state-of-charge (open circuit voltage) and condition. |
| C.1.4 | | P1 | Perform battery test (load and/or capacitance). |
| C.1.5 | | P1 | Inspect starter, mounting, and connections. |
| C.1.6 | | P1 | Engage starter; check for unusual noises, starter drag, and starting difficulty. |

VII.C.2 Charging System

| | | | |
|-------|---|----|--|
| C.2.1 | ? | P1 | Inspect alternator, mountings, wiring and wiring routing; determine needed action. |
| C.2.2 | | P1 | Perform alternator current output test. |
| C.2.3 | | P1 | Perform alternator voltage output test. |

VII.C.3 Lighting System

| | | | |
|-------|---|----|--|
| C.3.1 | ? | P1 | Check operation of interior lights; determine needed action. |
| C.3.2 | | P1 | Check all exterior lights, lenses, reflectors, & conspicuity tape; check headlight alignment; determine needed action. |
| C.3.3 | | P1 | Inspect and test tractor-to-trailer multi-wire connector(s), cable(s), and holder(s); determine needed action. |

VII.D.4 Suspension and Steering Systems

| | | | |
|--------|---|----|---|
| D.4.1 | ? | P1 | Check steering wheel operation for free play or binding. |
| D.4.2 | | P1 | Check power steering pump, mounting, and hoses for leaks, condition, and routing; check fluid level. |
| D.4.3 | | P1 | Change power steering fluid and filter. |
| D.4.4 | | P1 | Inspect steering gear for leaks and secure mounting. |
| D.4.5 | | P1 | Inspect steering shaft U-joints, pinch bolts, splines, pitman arm-to-steering sector shaft, tie rod ends, linkage, and linkage-assist power steering cylinders. |
| D.4.6 | | P1 | Check king pin wear. |
| D.4.7 | | P1 | Check wheel bearings for looseness and noise. |
| D.4.8 | | P1 | Check oil level and condition in all non-drive hubs; check for leaks. |
| D.4.9 | | P1 | Remove and inspect wheel bearings; reassemble and adjust. |
| D.4.10 | | P1 | Inspect springs, hangers, shackles, spring U-bolts, and insulators. |
| D.4.11 | | P1 | Inspect shock absorbers for leaks and secure mounting. |
| D.4.12 | | P1 | Inspect air suspension springs, mounts, hoses, valves, linkage, and fittings for leaks and damage. |
| D.4.13 | | P1 | Check and record suspension ride height. |
| D.4.14 | | P1 | Lubricate all suspension and steering grease fittings. |
| D.4.15 | | P1 | Check toe adjustment. |
| D.4.16 | | P1 | Check tandem axle alignment and spacing. |
| D.4.17 | | P1 | Check axle locating components (radius, torque, and/or track rods). |

VII.D.5 Tires and Wheels

| | | | |
|-------|---|----|--|
| D.5.1 | ? | P1 | Inspect tires for irregular wear patterns and proper mounting of directional tires. |
| D.5.2 | | P1 | Inspect tires for cuts, cracks, bulges, and sidewall damage. |
| D.5.3 | | P1 | Inspect valve caps and stems; replace as needed. |
| D.5.4 | | P1 | Measure and record tread depth; probe for imbedded debris. |
| D.5.5 | | P1 | Check and record air pressure; adjust air pressure in accordance with manufacturers' specifications. |
| D.5.6 | | P1 | Check for loose lugs and/or slipped wheels; check mounting hardware condition; service as needed. |

- D.5.7 P1 Retorque lugs in accordance with manufacturers' specifications.
- D.5.8 P1 Inspect wheels and spacers for cracks or damage.
- D.5.9 P1 Check tire matching (diameter and tread) on dual tire installations.

VII.D.6 Frame and Fifth Wheel

| Task | Job Sheet | Priority | |
|-------|-----------|----------|--|
| D.5.1 | ? | P1 | Inspect fifth wheel mounting bolts, air lines, and locks. |
| D.5.2 | | P1 | Test operation of fifth wheel locking device; adjust if necessary. |
| D.5.3 | | P1 | Check mud flaps and brackets. |
| D.5.4 | | P1 | Check pintles hook assembly and mounting. |
| D.5.5 | | P1 | Lubricate all fifth wheel grease fittings and plate. |
| D.5.6 | | P1 | Inspect frame and frame members for cracks and damage. |

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:

| | | | |
|------|-----------|----|---|
| 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.11 | 24 | P1 | Adjust valves (mechanical or hydraulic lifters). |

I.D LUBRICATION AND COOLING SYSTEMS DIAGNOSIS AND REPAIR

| | | | |
|--------|----|----|---|
| I.D.1 | 46 | P1 | Perform oil pressure tests; 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.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.13 | 57 | P1 | Perform oil and filter change. |

IV.A General Suspension and Steering Systems 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 suspension and steering concern; determine necessary action. |
| A.3 | 3 | P1 | Research applicable vehicle and service information, such as suspension and steering system 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 calibration decals). |

IV.C.3 Miscellaneous Service

| | | | |
|-------|----|----|---|
| C.3.1 | 35 | P1 | Inspect, remove and replace shock absorbers. |
| C.3.2 | 38 | P1 | Remove, inspect, and service or replace front and rear wheel bearings. |
| C.3.3 | 37 | P3 | Test /diagnose components of electronically- controlled suspension systems using a scan tool; determine necessary action. |

IV.E Wheel and Tire Diagnosis and Repair

| Task | Job Sheet | Priority | |
|------|-----------|----------|--|
| E.1 | 45 | P1 | Diagnose tire wear patterns; determine necessary action. |
| E.2 | 45 | P1 | Inspect tires check, and adjust air pressure. |
| E.3 | 46 | P2 | Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action. |
| E.4 | 47 | P1 | Rotate tires according to manufacturer's recommendations. |
| E.5 | 48 | P2 | Measure wheel, tire, axle, and hub run out; determine necessary action. |
| E.6 | 23 | P2 | Diagnose tire pull (lead) problem; determine corrective actions. |
| E.7 | 49 | P1 | Balance wheel and tire assembly (static and dynamic). |
| E.8 | 50 | P2 | Dismount, inspect, and remount tire on wheel. |
| E.9 | 51 | P3 | Dismount, inspect, and remount tire on wheel equipped with tire pressure sensor. |
| E.10 | 50 | P1 | Reinstall wheel; torque lug nuts. |
| E.11 | 52 | P1 | Inspect tire and wheel assembly for air loss; perform necessary action. |
| E.12 | 52 | P1 | Repair tire using internal patch. |
| E.13 | 51 | P3 | Inspect, diagnose, and calibrate tire pressure monitoring system. |

V.F Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

| | | | |
|-----|----|----|--|
| F.1 | 33 | P1 | Diagnose wheel bearing noises, wheel shimmy and vibration concerns; determine necessary action. |
| F.2 | 34 | P1 | Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings. |
| F.5 | 13 | P3 | Check operation of parking brake indicator light system. |
| F.6 | 13 | P1 | Check operation of brake stop light system; determine necessary action. |
| F.7 | 34 | P1 | Replace wheel bearing and race. |
| F.8 | 37 | P1 | Inspect and replace wheel studs. |
| F.9 | 38 | P2 | Remove and reinstall sealed wheel bearing assembly. |

VI.B Battery Diagnosis and Service

| | | | |
|-----|----|----|--|
| B.1 | 17 | P1 | Perform battery state-of-charge test; determine necessary action. |
| B.4 | 19 | P1 | Inspect, clean, fill and replace battery. |
| B.5 | 20 | P2 | Perform slow/fast battery charge. |
| B.6 | 19 | P1 | Inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed. |
| B.7 | 21 | P1 | Start a vehicle using jumper cables and a battery or auxiliary power supply. |

VI.E Lighting Systems Diagnosis and Repair

| | | | |
|-----|----|----|---|
| E.1 | 35 | P1 | Diagnose the cause of brighter than normal, intermittent, dim, or no light operation; determine necessary action. |
| E.2 | 36 | P2 | Inspect, replace, and aim headlights and bulbs. |
| E.3 | 35 | P2 | Inspect and diagnose incorrect turn signal or hazard light operation; perform necessary action. |

VII.A A/C System Diagnosis and Repair

| | | | |
|-----|---|----|---|
| 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 heating and air conditioning concern; determine necessary action. |
| A.3 | 3 | P1 | Research applicable vehicle and service information, such as heating and air conditioning system 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, calibration decals). |