

Odessa College
Technical Studies Division
Automotive Technology

Course Syllabus

COURSE NUMBER: AUMT 1345
COURSE TITLE: Automotive Heating and Air Conditioning
CREDIT HOURS: 3 **LECTURE HOURS:** 2 **LAB HOURS:** 4
PREREQUISITE: AUMT 1405, consent of department chair or instructor.

CATALOG DESCRIPTION:

Student will study the basic principles of climate control as related to the automobile. Topic such as heat, pressure, refrigerants, compressors, electrical control circuits, and other topics will be covered. Interpreting manifold gases and calculating correct additions of oil and refrigerant gases will give the student a good foundation in the air conditioning service business. The student's self-esteem will be improved as they communicate with co-workers to acquire new technical skills and diagnose problems and malfunctions of the A/C system. The reading of technical materials is required. Theory of automotive air conditioning and heating systems. Emphasis on the basic refrigeration cycle and diagnosis and repair of system malfunctions. Covers EPA guidelines for refrigerant handling and new refrigerant replacements. May be taught manufacturer specific. Lab fee required. (SCANS 1, 2, 3, 4, 5, 6, 7, 9, 10, 11) Prerequisite: Consent of department chair or instructor.

COURSE LEARNING OUTCOMES:

Utilize appropriate safety procedures; explain the operation of the basic refrigeration cycle; diagnose and repair HVAC systems; demonstrate proper procedures for handling refrigerant; and describe the operation of air conditioning and heating controls.

COMPETENCIES:

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

VII. HEATING AND AIR CONDITIONING

TEXTBOOK

Classroom Manual: Automotive Heating & Air Conditioning, Mark Schnubel, 3rd Edition, Thomson Delmar Learning, 2005
Shop Manual: Automotive Heating & Air Conditioning, Mark Schnubel, 3rd Edition, Thomson Delmar Learning, 2005

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

HEATING AND AIR CONDITIONING

For every task in Automotive Heating and Air Conditioning, 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. HEATING AND AIR CONDITIONING

VII.A A/C System Diagnosis and Repair

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 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).
A.5	4	P1	Performance test A/C system; diagnose A/C system malfunctions using principles of refrigeration.
A.6	5	P2	Diagnose abnormal operating noises in the A/C system; determine necessary action.
A.7	6,7	P1	Identify refrigerant type; select and connect proper gauge set; record pressure readings.
A.8	8	P1	Leak test A/C system; determine necessary action.
A.9	9	P2	Inspect the condition of discharged oil; determine necessary action.
A.10	9	P1	Determine recommended oil for system application.
A.11	10	P1	Using scan tool, observe and record related HVAC data and trouble codes.

VII.B Refrigeration System Component Diagnosis and Repair

VII.B.1 Compressor and Clutch

B.1.1	11	P2	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.
B.1.2	12	P1	Inspect and replace A/C compressor drive belts; determine necessary action.
B.1.3	11	P2	Inspect, test, and replace A/C compressor clutch components or assembly.
B.1.4	13	P1	Remove, inspect, and reinstall A/C compressor and mountings; determine required oil quantity.
B.1.5	14	P3	Identify hybrid vehicle A/C system electrical circuits, service, and safety precautions.

VII.B.2 Evaporator, Condenser, and Related Components

B.2.1	15	P3	Determine need for an additional A/C system filter; perform necessary action.
B.2.2	16	P2	Remove / inspect A/C system mufflers, hoses, lines, fittings, o-rings, seals, and service valves; perform necessary action.
B.2.3	5	P1	Inspect A/C condenser for air flow restrictions; perform necessary action.
B.2.4	16	P1	Remove, inspect, and reinstall receiver/drier or accumulator/ drier; determine required oil quantity.
B.2.5	16	P1	Remove and install expansion valve or orifice (expansion) tube.
B.2.6	17	P3	Inspect evaporator housing water drain; perform necessary action.
B.2.7	18	P3	Remove, inspect, and reinstall evaporator; determine required oil quantity.
B.2.8	19	P3	Remove, inspect, and reinstall condenser; determine required oil quantity.

VII.C Heating and Engine Cooling System Diagnosis and Repair

C.1	20	P2	Diagnose temperature control problems in the heater/ventilation system; determine necessary action.
C.2	21	P1	Perform cooling system pressure tests; check coolant condition, inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.
C.3	22	P1	Inspect engine cooling and heater system hoses and belts; perform necessary action.
C.4	23	P1	Inspect, test, and replace thermostat and gasket.
C.5	21	P1	Determine coolant condition and coolant type for vehicle application; drain and recover coolant.
C.6	21	P1	Flush system; refill system with recommended coolant; bleed system.
C.7	24	P1	Inspect, and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.
C.8	25	P1	Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.
C.9	26	P2	Inspect and test heater control valve(s); perform necessary action.
C.10	27	P3	Remove and reinstall heater core.

VII.D Operating Systems and Related Controls Diagnosis and Repair

Task	Job Sheet	Priority	
D.1	28	P2	Diagnose malfunctions in the electrical controls of heating, ventilation and A/C systems; determine necessary action.
D.2	29	P1	Inspect & test A/C-heater blower, motors, resistors, switches, relays, wiring & protection devices; perform necessary action
D.3	30	P1	Test A/C compressor clutch control systems; determine necessary action.
D.4	28	P2	Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.
D.5	31	P3	Inspect and test A/C-heater control panel assembly; determine necessary action.
D.6	28	P3	Inspect and test A/C-heater control cables and linkages; perform necessary action.
D.7	32	P3	Inspect and test A/C-heater ducts, doors, hoses, and outlets; perform necessary action.
D.8	33	P3	Check operation of automatic and semi-automatic heating, ventilation, and air conditioning (HVAC) control systems; determine necessary action.

VII.E Refrigerant Recovery, Recycling and Handling

E.1	34	P1	Perform correct use and maintenance of refrigerant handling equipment.
E.2	35	P1	Identify (by label application or use of a refrigerant identifier) and recover A/C system refrigerant.
E.3	36	P1	Recycle refrigerant.
E.4	36	P1	Label and store refrigerant.
E.5	37	P1	Test recycled refrigerant for non-condensable gases.
E.6	38	P1	Evacuate and charge A/C system.