

MARTIN COMMUNITY COLLEGE
COURSE SYLLABUS
Semester/Year: Spring 2011

COURSE NUMBER:	AUT 171 (01)	INSTRUCTOR:	Mr. Robert Swisher
COURSE TITLE:	Auto Climate Control	OFFICE NO:	Building 3, Room 7
CREDIT HOURS:	3	OFFICE/VIRTUAL HOURS:	NA
CONTACT HRS/WK:	6 (4 class, 2 lab)	PHONE NO:	252-789-0212
PREREQUISITES:	None	FAX:	252-792-0826
COREQUISITES:	None	E-MAIL:	rswisher@mcc.martincc.edu

COURSE DESCRIPTION: This course covers the theory of refrigeration and heating, electrical/electronic/pneumatic controls, and diagnosis/repair of climate control systems. Topics include diagnosis and repair of climate control components and systems, recovery/recycling of refrigerants, and safety and environmental regulations. Upon completion, students should be able to describe the operation, diagnose, and safely service climate control systems using appropriate tools, equipment, and service information.

PROGRAM LEARNING OUTCOMES:

1. Inspect, diagnose, disassemble, repair, replace and service each of the major systems in various types of vehicles to a NATEF standard.
2. Perform with accuracy, dependability, proficiency, and in a timely manner when servicing automotive systems
3. Discuss industry standards and employer/customer expectations for employees in the automotive industry workplace

COURSE LEARNING OUTCOMES:

1. Describe the theory of refrigeration and heating system operation
2. Discuss recovery/recycling of refrigerants
3. Diagnose and service climate control systems

NATEF OBJECTIVES:

A. A/C System Diagnosis and Repair

1. Identify and interpret heating and air conditioning concern; determine necessary action. P-1
2. Research applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins. P-1
3. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals). P-1
4. Performance test A/C system; diagnose A/C system malfunctions using principles of refrigeration. P-1
5. Diagnose abnormal operating noises in the A/C system; determine necessary action. P-2
6. Identify refrigerant type; conduct a performance test of the A/C system; determine necessary action. P-1
7. Leak test A/C system; determine necessary action. P-1

8. Inspect the condition of discharged oil; determine necessary action. P-2
9. Determine recommended oil for system application. P-1

VII. HEATING AND AIR CONDITIONING

B. Refrigeration System Component Diagnosis and Repair

1. Compressor and Clutch

1. Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action. P-2
2. Inspect A/C compressor drive belts; determine necessary action. P-2
3. Inspect, test, and/or replace A/C compressor clutch components and/or assembly. P-2
4. Remove and reinstall A/C compressor and mountings; measure oil quantity; determine necessary action. P-1

2. Evaporator, Condenser, and Related Components

1. Determine need for an additional A/C system filter; perform necessary action. P-3
2. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action. P-2
3. Inspect A/C condenser for airflow restrictions; perform necessary action. P-1
4. Remove and reinstall receiver/drier or accumulator/drier; measure oil quantity; determine necessary action. P-1
5. Remove and install expansion valve or orifice (expansion) tube. P-2
6. Inspect evaporator housing water drain; perform necessary action. P-3

7. Remove and reinstall evaporator; measure oil quantity; determine necessary action. P-3
8. Remove and reinstall condenser; measure oil quantity; determine necessary action. P-3

VII. HEATING AND AIR CONDITIONING

C. Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

1. Diagnose temperature control problems in the heater/ventilation system; determine necessary action. P-2
2. Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action. P-1
3. Inspect engine cooling and heater system hoses and belts; perform necessary action. P-1
4. Inspect, test, and replace thermostat and housing. P-1
5. Determine coolant condition and coolant type for vehicle application; drain and recover coolant. P-1
6. Flush system; refill system with recommended coolant; bleed system. P-1
7. Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action. P-1
8. Inspect and test electric cooling fan, fan control system and circuits; determine necessary action. P-1
9. Inspect and test heater control valve(s); perform necessary action. P-2
10. Remove and reinstall heater core. P-3

VII. HEATING AND AIR CONDITIONING

D. Operating Systems and Related Controls Diagnosis and Repair

1. Diagnose malfunctions in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action. P-2
2. Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action. P-1
3. Test and diagnose A/C compressor clutch control systems; determine necessary action. P-1
4. Diagnose malfunctions in the vacuum and mechanical components and controls of the heating, ventilation,

- and A/C (HVAC) system; determine necessary action. P-2
5. Inspect and test A/C-heater control panel assembly; determine necessary action. P-3
 6. Inspect and test A/C-heater control cables and linkages; perform necessary action. P-3
 7. Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action. P-3
 8. Check operation of automatic and semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action. P-3

VII. HEATING AND AIR CONDITIONING

E. Refrigerant Recovery, Recycling, and Handling

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

REQUIRED TEXTBOOKS:

Text: Gilles. (2008) Automotive service: Inspection maintenance repair (3rd ed.): Thompson Delmar. ISBN: 1-4180-3758-3.

Worktext: Hadfield. (2008) Automotive job sheets for NATEF task mastery (1st ed.) Clifton Park: Thompson Delmar. ISBN: 1-4180-7302-1

SUPPLEMENTAL RESOURCES:

Required Supplies: Approved Safety Glasses

Basic Tool Set (See Attached)

NOTE: SAFETY GLASSES ARE REQUIRED TO BE WORN AT ALL TIMES WHILE IN THE SHOP AREA AND IN THE OUTSIDE WORK AREA

Reference Materials: Information on Shop-Key discs; and videos from manufactures; on new up-date engines.

LEARNING/TEACHING METHODS: Lecture, VHS tapes, textbooks and various manufacturers' specifications and repair manuals, outside reading assignments, hands-on lab

GRADING POLICY:

Grading will be based on a minimum of four (4) tests, a final exam and lab work and outside reading assignment.

Classroom	20%
Shop	20%
Tests	20%
Outside Reading Assignments	15%
Final Exam	25%

(Determined by quality of work done, quantity of work and dependability in completing job tasks.)

A=90-100 B=80-89 C=70-79 D=60-69 F=59 and below

COURSE OUTLINE:

Week 1: Principles of heating and refrigeration Chap 22

Week 2: Heating Systems

Week 3: Air Cond-Refrigeration cycle

Week 4: Expansion Valve System

Week 5: Orifice Tube System

Week 6: Thermostatic Control

Week 7: Refrigerants and oils

Week 8: Condenser, Evaporator, Receiver/Dryer

Week 9: Accumulator, lines and hoses

Week 10: Compressors and controls Chap 23

Week 11: Heater trouble diagnostics

Week 12: Checking A/C system performance

Week 13: Temp. and press. Measurements.

Week 14: Refrigerants and connections

Week 15: Retrofitting R-12 –R-134 systems

Week 16: Review and exams

STUDENT ATTENDANCE POLICY: Martin Community College recognizes that academic success is tied to regular attendance and completion of assigned work and tasks in a timely manner. Students are expected to attend a minimum of 80 percent of the total hours for a course, which includes classes, labs, and shops. Some courses and programs have stricter attendance requirements of 85, 90, or 95 percent based upon the difficulty and complexity of the subject matter. General Education and Developmental courses require 85 percent attendance. The syllabus for each course will specify the attendance requirement.

Students must be present in at least one class during the first ten percent (10%) of a course in order to be considered enrolled in the class. If a student has not attended at least one class by the ten percent census date, the instructor will administratively withdraw the student.

Students who miss more than six contiguous contact hours or fail to attend the required percentage of total hours without a justifiable absence and verifiable contact with the instructor may be administratively withdrawn from the class by the instructor and given a grade of “WF.” The “WF” will be equivalent to an “F” when calculated into the student’s GPA. The course syllabus will indicate what the instructor considers a justifiable absence and will define “verifiable contact.” Students may remove a “WF” by submitting appropriate paperwork for an official withdrawal by the last day to officially withdraw without receiving an “F.” The last day to officially withdraw without receiving an “F” is published in the academic calendar for each academic year. The official withdrawal date for mini sessions, block courses, or other non-traditional schedules are available from the registrar and will be included on the course syllabus.

Make-up work may be allowed at the discretion of the instructor, and the instructor’s policy on make-up work will be included in the course syllabus. Students in clinical and cooperative educational work experiences must complete 100 percent of the required hours to receive a passing grade. Clinical or cooperative work experience make-up hours require clinical or cooperative educational work site approval and approval of the instructor.

Habitual tardiness and/or early departure in a course may, at the discretion of the instructor, be considered in computing class attendance. The course syllabus will include the instructor’s definition of tardiness and early departure.

Students will be counted absent from the date they register for each course.

Note: Under DVA regulations, the enrollment of veterans or dependents will be terminated or adjusted if they are administratively withdrawn or if they officially withdraw.

If an instructor fails to report for a class within 15 minutes of the scheduled beginning time and has not left instructions, those students present should sign a sheet before leaving and designate a student to submit it to the Dean of Academic Affairs and Student Services

REQUEST FOR EXCUSED ABSENCES FOR RELIGIOUS OBSERVANCES*

***In compliance with G.S. 115D-5, MCC policy permits a student to be excused, with the opportunity to make-up any test or other missed work, a minimum of two excused absences per academic year for religious observances required by the student's faith. The policy limits the excused absences to a maximum of two days per academic year.**

Students who wish to be excused for a Religious Observance required by their faith must complete and submit a request form to the instructor(s) prior to the census date of each class. The ***Request for Excused Absences for Religious Observances*** form can be picked up from Student Services. This does not supersede the college-wide attendance policy as outlined in the college catalog or syllabus, with the exception of a reasonable accommodation for the make-up of missed course work.

COURSE POLICIES:

All persons will have and wear safety glasses at all times in shop or lab areas. Failure to adhere to safety glasses rules will result in removal from the lab area and may result in disciplinary action.

The shop area is defined as Rm 10A, 10B, 10C and the area the area enclosed by the chain link fence outside the lab bay doors of building 3

Students are permitted, when entering the lab, to do so, at their own risk, without glasses if they are going directly to their tool box/work station to retrieve their glasses. "Passing through" to classrooms or hallways by employing the lab area while not wearing safety glasses is not allowed. This includes entry to the lab/class area from the parking area via the fence gate.

1. Eating /Drinking not allowed in classroom or Laboratory.
2. Work-style pants are recommended or proper fitting jeans that meet the following requirements (length above the shoes, jeans above the hip with belt/suspenders). No oversized pants/jeans will be permitted. **Shorts are not allowed.** Labcoats/Aprons are highly recommended to prevent damage to regular clothing.
3. We suggest that you refrain from wearing necklaces, rings, or bracelets of any kind as these items may pose a safety hazard. Likewise, facial jewelry can compound injury and wearing of same is discouraged in the lab
4. All belts will be of the type that does not have an exposed buckle. No keys, chains or wallets hanging out of pockets.
5. Hats are permitted in the shop area only! If a hat has a brim, it must be worn with it facing forward.
6. Students must wear leather or composite work boots or shoes. We highly recommend those with steel toes, oil resistant soles. No open toed shoes are permitted.

7. Other appearance issues not directly covered by these rules will be considered on a case-by-case basis. MCC staff will decide what is safe and professional in appearance and what is not.

Any Student Not Following These Guidelines Will Be Dismissed From Class and Attendance Credit for That Day Will Not Be Given. No Excuses Will Be Considered.

Students must have their tools required for class available to them at class time.

No Tools, No Lab Credit.

If you cannot reach your instructor, you may contact Dr. Phyllis Broughton, Dean of Academic Affairs and Student Services at (252)792-1521 extension 246 by phone, pbroughton@martincc.edu by e-mail, or in person at her office in Building 2, Room 33.

To access the Martin Community College Career Catalog for policies and curriculum requirements, please go online to www.martincc.edu.

If you have a need for a disability-related accommodation, please notify the Student Services counselor at (252) 792-1521, ext. 293.