



**COWLEY COLLEGE
& Area Vocational Technical School**

COURSE PROCEDURE FOR

**HEATING AND AIR CONDITIONING
AMS3182 4 Credit Hours**

Student Level:

This course is open to students on the college level in either the freshman or sophomore year and to area high school vocational students.

Catalog Description:

AMS 3182 - HEATING AND AIR CONDITIONING (4 hrs)

This course will enable the student to gain basic understanding and hands on experience utilizing industry standard procedures in the diagnosing and repair of heating and air conditioning systems. Topics presented throughout the course cover all related refrigerant system components, heating, ventilation, and engine cooling systems. Also provides training on refrigerant recovery and handling in accordance with strict federal government guidelines.

Prerequisites:

None

Controlling Purpose:

This course is designed to help the student increase their knowledge concerning entry-level skills contained in the sequenced competencies, for success, after graduation from the Automotive Technology Program.

Learner Outcomes:

Upon completion of this course, the student will be able to identify the principles and procedures of air conditioning components.

The learning outcomes and competencies detailed in this course outline or syllabus meet or exceed the learning outcomes and competencies specified by the Kansas Core Outcomes Groups project for this course as approved by the Kansas Board of Regents.

Units Outcomes and Criterion Based Evaluation Key for Core Content:

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

Evaluation Key:

A = All major and minor goals have been achieved and the achievement level is considerably

- above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.
- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

UNIT 1: A/C System Diagnosis and Repair

Outcomes: The student will demonstrate a broad knowledge of the A/C system and obtain general diagnostic skills.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Identify and interpret heating and air conditioning concern; determine necessary action.
						Research applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins.
						Locate and interpret vehicle and major component identification numbers (VIN, vehicle cert. labels, calibration decals).
						Performance test A/C system; diagnose A/C system malfunctions using principles of refrigeration.
						Diagnose abnormal operation noises in the A/C system; determine necessary action.
						Identify refrigerant type; conduct a performance test of the A/C system; determine necessary action.
						Leak test A/C system; determine necessary action.
						Inspect the condition of discharged oil; determine necessary action.
						Determine recommended oil for system application.
						Identify and interpret heating and air conditioning concern; determine necessary action.
						Research applicable vehicle and service information, such as heating and air conditioning system operation, vehicle service history, service precautions, and technical service bulletins.
						Locate and interpret vehicle and major component identification numbers (VIN, vehicle cert. labels, calibration decals).
						Performance test A/C system; diagnose A/C system malfunctions using principles of refrigeration.

UNIT 2: Refrigeration System Component Diagnosis and Repair (*Compressor and Clutch*)

Outcomes: The student will demonstrate an understanding of the A/C refrigeration system (compressor and clutch) to include diagnosis and repair.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation; determine necessary action.
						Inspect A/C compressor drive belts; determine necessary action.
						Inspect, test, and/or replace A/C compressor clutch components and/or assembly.
						Remove and reinstall A/C compressor and mountings; measure oil quantity; determine necessary action.

UNIT 3: Refrigeration System Component Diagnosis and Repair

(Evaporator, Condenser, and Related Components)

Outcomes: The student will demonstrate an understanding of the A/C refrigeration system (evaporator, condenser) to include diagnosis and repair.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Determine need for an additional A/C system filter; perform necessary action.
						Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.
						Inspect A/C condenser for airflow restrictions; perform necessary action.
						Remove and reinstall receiver/drier or accumulator/drier; measure oil quantity; determine necessary action.
						Remove and install expansion valve or orifice (expansion) tube.
						Inspect evaporator housing water drain; perform necessary action.
						Remove and reinstall evaporator; measure oil quantity; determine necessary action.
						Remove and reinstall condenser; measure oil quantity; determine necessary action.
						Inspect A/C condenser for airflow restrictions; perform necessary action.

UNIT 4: Refrigeration System Component Diagnosis and Repair***(Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair)***

Outcomes: The student will demonstrate an understanding of the A/C refrigeration system (heating, ventilation, and engine cooling) to include diagnosis and repair.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Diagnose temperature control problems in the heater/ventilation system; determine necessary action.
						Perform cooling system, cap, and recovery system tests (pressure, combustion leakage, and temperature); determine necessary action.
						Inspect engine cooling and heater system hoses and belts; perform necessary action.
						Inspect, test, and replace thermostat and housing.
						Determine coolant condition and coolant type for vehicle application; drain and recover coolant.
						Flush system; refill system with recommended coolant; bleed system.
						Inspect and test cooling fan, fan clutch, fan shroud, and air dams; perform necessary action.
						Inspect and test electric cooling fan, fan control system and circuits; determine necessary action.
						Inspect and test heater control valve(s); perform necessary action.
						Remove and reinstall heater core.

UNIT 5: Refrigeration System Component Diagnosis and Repair
(Operating Systems and Related Controls Diagnosis and Repair)

Outcomes: The student will gain an understanding of the heating, ventilation and A/C systems and perform common tests related to each system.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Diagnose malfunctions in the electrical controls of heating, ventilation, and A/C (HVAC) systems; determine necessary action.
						Inspect and test A/C-heater blower, motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.
						Test and diagnose A/C compressor clutch control systems; determine necessary action.
						Diagnose malfunctions in the vacuum and mechanical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.
						Inspect and test A/C heater control panel assembly; determine necessary action.
						Inspect and test A/C-heater control cables and linkages; perform necessary action.
						Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets; perform necessary action.
						Check operation of automatic and semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.

UNIT 6: Refrigeration System Component Diagnosis and Repair***(Refrigerant Recovery, Recycling, and Handling)***

Outcomes: The student will demonstrate the ability to perform routine A/C tests and properly work with refrigerant.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Perform correct use and maintenance of refrigerant handling equipment.
						Identify (by label application or use of a refrigerant identifier) and recover A/C system refrigerant.
						Recycle refrigerant.
						Label and store refrigerant.
						Test recycled refrigerant for non-condensable gases.
						Evacuate and charge A/C system.

Projects Required:

As assigned

Textbook:

Contact Bookstore for current textbook.

Materials/Equipment Required:

Students are required to furnish their own Personal Protection Equipment i.e. Safety Glasses.

Attendance Policy:

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

Grading Policy:

The grading policy will be outlined by the instructor in the course syllabus.

Maximum class size:

Based on classroom occupancy

Course Timeframe:

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency

Rev: 06/01/2016

DISCLAIMER: THIS INFORMATION IS SUBJECT TO CHANGE. FOR THE OFFICIAL COURSE PROCEDURE CONTACT ACADEMIC AFFAIRS.

that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time. The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

Refer to the following policies:

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

Disability Services Program:

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability, which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.