COURSE PREFIX:	**ACR 220**
COURSE TITLE:	**Advanced Air Conditioning**
LEC HRS/ WEEK:	**3.0**
LAB HRS/WEEK:	**3.0**
CREDIT HRS/SEMESTER:	**4.0**

DL Attendance/VA Statement
Textbook Information

Course Description:

This course is an advanced study of air conditioning systems.

Course Competencies:

Upon successful completion of this course, the student should be competent to perform the following:

Module 1: Air Systems Analysis

Classroom:

09.B.01.a	K	Identify the following on a psychrometric chart: dry bulb line (DB).
09.B.01.b	K	Identify the following on a psychrometric chart: wet bulb line (WB).
09.B.01.c	K	Identify the following on a psychrometric chart: relative humidity (RH).
09.B.01.d	K	Identify the following on a psychrometric chart: dew point (DP).
09.B.01.e	K	Identify the following on a psychrometric chart: enthalpy (h).
09.B.01.f	K	Identify the following on a psychrometric chart: specific humidity (grains of moisture) or (lbw/lbda).
09.B.01.g	K	Identify the following on a psychrometric chart: apparatus dew point.
09.B.02.a	K	Explain: specific humidity.
09.B.02.c	K	Explain: contact factor.
15.B.01.a	K	Identify types of mechanical filters: disposable.
15.B.01.b	K	Identify types of mechanical filters: permanent foam, mesh, and fiber.
15.B.01.c	K	Identify types of mechanical filters: high efficiency.
15.B.01.d	K	Identify types of mechanical filters: HEPA.
15.B.01.e	K	Identify types of mechanical filters: electrostatic.
15.B.02	K	Describe operation of electronic air cleaners.

Lab:

04.E.01.a	T	Determine air velocity within a duct via: pitot tube.
04.E.01.b	T	Determine air velocity within a duct via: inclined manometer.
04.E.01.c	T	Determine air velocity within a duct via: electronic velometer.
04.E.01.d	T	Determine air velocity within a duct via: U-tube manometer.
04.E.02.a	T	Determine air velocity at grilles and diffusers via: deflecting vane anemometer.
04.E.02.b	T	Determine air velocity at grilles and diffusers via: velometer.
04.E.02.c	T	Determine air velocity at grilles and diffusers via: hot wire anemometer.
04.E.02.d	T	Determine air velocity at grilles and diffusers via: pitot tube.
04.E.02.e	T	Determine air velocity at grilles and diffusers via: rotating vane anemometer.
04.E.06	T	Solve problems using friction loss chart.
09.B.03.a	T	Calculate: refrigeration sensible heat ratio.
09.B.03.b	T	Calculate: latent heat ratio.
09.B.03.c	T	Calculate: contact factor.
09.B.03.d	T	Calculate: latent heat.
09.B.03.e	T	Calculate: sensible heat.
09.B.03.f	T	Calculate: total heat.
09.B.03.g	T	Calculate: water removal.
09.B.03.h	T	Calculate: mixed air condition.
09.B.04.a	T	On a psychrometric chart, plot the following: sensible heating.
09.B.04.b	T	On a psychrometric chart, plot the following: sensible cooling.
09.B.04.c	T	On a psychrometric chart, plot the following: heating and humidifying.
09.B.04.d	T	On a psychrometric chart, plot the following: heating and dehumidifying.
09.B.04.e	T	On a psychrometric chart, plot the following: cooling and humidifying.
09.B.04.f	T	On a psychrometric chart, plot the following: cooling and dehumidifying.
09.B.04.g	T	On a psychrometric chart, plot the following: humidifying.
09.B.04.h	T	On a psychrometric chart, plot the following: dehumidifying.
09.B.04.i	T	On a psychrometric chart, plot the following: cooling cycle.
09.B.04.j	T	On a psychrometric chart, plot the following: mixed air process.
09.B.04.k	T	On a psychrometric chart, plot the following: cooling and reheat.
15.A.01	T	Draw layout of return and supply runs.
15.A.02	T	Calculate equivalent length of trunk and branch ducts.
15.A.03	T	Calculate total effective length of duct runs.
15.A.04	T	Calculate total available static pressure.
15.A.05	T	Size trunk and branch ducts by equal friction method.
15.A.06	T	Use duct calculator to find duct size, velocity, cfm, and friction loss.
15.A.07	T	Calculate airflow factors for heating and cooling.
15.A.08	T	Size registers, grilles, and diffusers.
15.B.03	T	Install air cleaner system into existing ductwork.
15.B.04.a	T	Remove and clear prefilter and cells: check ionizer wires.
15.B.04.b	T	Remove and clear prefilter and cells: test power pack.

Module 2: Commercial Systems

Classroom:

10.D.03	K	Describe maintenance of a condenser and a cooling tower.
10.D.05	K	Explain the terms “range” and “approach” related to cooling towers.
10.D.06	K	Explain purpose of heat reclaim.
10.E.01.c	K	Identify the proper location of all accessories: crankcase pressure regulating valves.
10.E.01.f	K	Identify the proper location of all accessories: evaporator pressure regulating valves.
10.E.01.g	K	Identify the proper location of all accessories: head pressure controls.
10.E.01.q	K	Identify the proper location of all accessories: unloaders.
10.E.01.r	K	Identify the proper location of all accessories: vibration eliminators.
10.E.01.t	K	Identify the proper location of all accessories: water regulating valve.
10.E.01.u	K	Identify the proper location of all accessories: liquid sight valve-refrigerant and oil.
10.E.01.v	K	Identify the proper location of all accessories: relief valve.
14.A.01	K	Explain the importance of compressor/evaporator balance.
14.A.02	K	Describe the differences in compressor displacement between the various temperature ranges.
14.A.03	K	Explain basic low and high pressure control theory and operation.
14.A.04	K	Explain the operation of a vapor compression system and its effects on temperature and volume.
14.A.05	K	Explain the operation and components used for the pump down cycle.
14.A.06	K	Explain the evaporator and the condenser side of a system.
14.A.07	K	Explain application and operation of evaporator pressure regulating valves.
14.A.08.a	K	Discuss the problems associated with compressors operating at lower evaporator temperatures: decreased volumetric efficiency.
14.A.08.b	K	Discuss the problems associated with compressors operating at lower evaporator temperatures: higher discharge gas temperatures.
14.A.08.c	K	Discuss the problems associated with compressors operating at lower evaporator temperatures: potential overloading during initial temperature pull-down.
14.A.09	K	Discuss the use of different compressor designs for increased efficiency and capacity.
14.A.10	K	Describe the methods used for cycling the compressor on and off.
14.A.11	K	Explain methods of defrost.
14.A.12	K	Explain methods of head pressure control system.
14.A.13	K	Explain heat reclaim.
14.A.14	K	Explain the lubrication methods for a compressor.
14.A.15	K	Determine the terminal identification of a single-phase compressor.
14.A.16	K	Explain how to measure the compressor lubrication oil pressure.
14.A.17	K	Explain several manufacturers’ model numbering system.

14.A.18	K	Define compression ratio and the effect suction and discharge pressures have on compression ratio.
14.A.19	K	Determine compressor capacity using the compressor's curve.
14.A.20	K	Determine the correct operating amps using the compressor's curve.
14.A.21	K	Describe the different types (hermetic, semi-hermetic, and open drive) and designs (reciprocating, scroll, and screw) of compressors.
14.A.22.a	K	Explain requirements of food preservation: medium temperature.
14.A.22.b	K	Explain requirements of food preservation: low temperature.
14.A.23	K	Describe supermarket display cases. 14.A.24K Explain the difference between an across-the-line start and a part-winding start.

Lab:

10.D.08	T	Adjust water flow for proper gallons per minute (GPM) and temperature difference.
10.D.09	T	Size a cooling tower.
10.E.05	T	Adjust a crankcase pressure regulating valve.
13.C.04	T	Perform balance method for an air distribution system.
14.A.25	T	Identify the different types of compressors.
14.A.26	T	Select a compressor for a particular capacity and temperature range.
14.A.27	T	Check the operation of a compressor in a particular system.
14.A.28	T	Compute the compression ratio for a particular system.
14.A.29	T	Adjust Evaporator Pressure Regulating (EPR) valve.
14.A.30	T	Check control circuits per manufacturers' specifications.
14.A.31	T	Check system charge, superheat, and subcooling.
14.A.32	T	Check display case temperatures and determine if operating properly.
14.A.33	T	Set cut-in and cut-out for a special product.
14.A.34	T	Draw the wiring diagrams for an across-the-line start and a part-winding start.
14.A.35	T	Draw a ladder diagram of a system equipped with a pump down cycle.
14.A.36	T	Draw the schematic of a single-phase and a three-phase | compressor motor.
14.A.37	T	Draw a ladder diagram of a system using a defrost time clock and defrost termination fan delay switch.
14.A.38	T	Measure the compressor windings and determine if they are correct.
14.A.39	T	Measure the operating amps and determine if it is correct.
14.A.40	T	Check operation of defrost cycle and adjust time clock.
14.A.41	T	Adjust head pressure controls for proper operation.
14.A.42	T	Check operation of equipment equipped for automatic pump down.

Module 3: Preventative Maintenance

19.A.06.f	T	Develop a Preventative Maintenance Program for: Ice makers.
19.A.06.k	T	Develop a Preventative Maintenance Program for: Walk-in boxes.
19.A.06.m	T	Develop a Preventative Maintenance Program for: Water-cooled reciprocating chiller.
19.A.07	T	Develop a list of tools needed to perform the Preventative Maintenance Program.
19.A.08	T	Develop a Preventative Maintenance Check Sheet.

Course Requirements

Students are responsible for attaining competencies through completion of the following course requirements:

Attendance Policy

Students will be bound by the policies stated in the York Technical College Student Handbook. Students must attend 80% of the hours assigned the class for a semester to receive credit for the course. In case a student does miss a class, the student is responsible for obtaining the material that was covered during the absence. If a student is aware that a class will be missed, then the student should notify the instructor at the earliest possible date. Students with unexcused absences during tests will be allowed to make up tests at the discretion of the instructor. The student has the burden to be sure that some arrangement has been made with the instructor for taking a make-up test.

Academic Honesty

York Technical College adheres to the South Carolina Tech Student code, approved by the State Board for Technical and Comprehensive Education on March 13, 1974 (revised last April 25, 1984). Copies of this code are available in the Library and from Student Services. Any student involved in cheating or any other academic dishonesty will be given a grade of zero and will be subject to further disciplinary action. See the student handbook section “Student Life” subheading “Student Conduct” for further details.

Class Participation

Students will be expected to participate in class discussions, to demonstrate problem-solving techniques, to complete tests, homework, lab experiments, lab reports and other assigned work.

Evaluation Strategies/Grading

The grading scale will be as follows:

Grade	Points
A	90-100
B	80-89
C	70-79
D	60-69
F	00-59

Evaluation Method

Tests may be written or oral and may contain questions that are true or false, short answer, multiple choice, fill in the blank and/or problems. Students should refer to the instructor for the number of tests to be given and the material to be covered on each test. Each test will be of equal weight unless otherwise indicated by the instructor. Lab grades will be based on the completion of the Course Competencies, team work, safety, class participation, and housekeeping.

Final grades will be determined as follows:

Module 1	Tests	25%
	Lab	15%
Module 2	Tests	25%
	Lab	15%
Module 3	Lab	20%
Total Grade		100%

Entry-Level Skills

Students should demonstrate hand eye coordination, manual dexterity, and be able to work in an industrial environment.

Prerequisites

ACR 120

Co-Requisites

None

Disability Statement: Any student who feels s/he may need an accommodation based on the impact of a disability should contact the Special Resources Office (SRO) at 803-327-8007 in the 300 area of Student Services. The SRO coordinates reasonable accommodations for students with documented disabilities.