



Program Planning Guide

Air Conditioning, Heating, and Refrigeration Technology, Associate in Applied Science (A35100)

Program Length: 6 semesters

Program Sites: Center for Workforce Innovation/Howard James Industrial Training Center

Career Pathway Options: Associate in Applied Science Degree in Air Conditioning, Heating, and Refrigeration

Suggested Course Schedule		Class	Lab	Work	Credits	Notes:
1st Semester (fall)						
AHR 110	Intro to Refrigeration	2	6	0	5	
AHR 111	HVACR Electricity	2	2	0	3	
ACA 122	College Transfer Success	0	2	0	1	
English requirement, select one:						
ENG 110	Freshman Composition	3	0	0	3	
ENG 111	Writing and Inquiry	3	0	0	3	
	Total Semester Hours	7	4	0	12	
2nd Semester (spring)						
AHR 112	Heating Technology	2	4	0	4	
AHR 113	Comfort Cooling	2	4	0	4	
AHR 114	Heat Pump Technology	2	4	0	4	
COM 110	Introduction to Communication	3	0	0	3	
	Total Semester Hours	9	12	0	15	
3rd Semester (summer)						
AHR 115	Refrigeration Systems	1	3	0	2	
AHR 160	Refrigerant Certification	1	0	0	1	
Humanities/Fine Arts Elective		3	0	0	3	
	Total Semester Hours	5	3	0	6	


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4th Semester (fall)						
AHR 125	HVACR Electronics	2	2	0	3	
AHR 133	HVAC Servicing	2	6	0	4	
AHR 151	HVAC Duct Systems I	1	3	0	2	
Math/Physics Requirement, select one:						
MAT 110	Math Measurement & Literacy	2	2	0	2	
MAT 143	Quantitative Literacy	2	2	0	3	
PHY 121	Applied Physics I	3	2	0	4	
	Total Semester Hours	7/8	13	0	11/12/13	
5th Semester (spring)						
AHR 180	HVACR Customer Relations	1	0	0	1	
AHR 212	Advanced Comfort Solutions	2	6	0	4	
AHR 213	HVACR Building Code	1	2	0	2	
AHR 215	Commercial HVAC Controls	1	3	0	2	
AHR 225	Commercial Systems Design	2	3	0	3	
	Total Semester Hours	7	14	0	12	
6th Semester (summer)						
AHR 211	Residential Systems Design	2	2	0	3	
WBL 111	Work-Based Learning I	0	0	10	1	
Social/Behavioral Science Elective		3	0	0	3	
	Total Semester Hours	5	2	10	7	
Total Semester Hours Required for Graduation: 63						



Course Descriptions

ACA 122 College Transfer Success

This course provides information and strategies necessary to develop clear academic and professional goals beyond the community college experience. Topics include the CAA, college policies and culture, career exploration, gathering information on senior institutions, strategic planning, critical thinking, and communications skills for a successful academic transition. Upon completion, students should be able to develop an academic plan to transition successfully to senior institutions. This course has been approved for transfer under the CAA/ICAA as a premajor and/or elective course requirement.

AHR 110 Intro to Refrigeration

This course introduces the basic refrigeration process used in mechanical refrigeration and air conditioning systems. Topics include terminology, safety, and identification and function of components; refrigeration cycle; and tools and instrumentation used in mechanical refrigeration systems. Upon completion, students should be able to identify refrigeration systems and components, explain the refrigeration process, and use the tools and instrumentation of the trade.

AHR 111 HVACR Electricity

This course introduces electricity as it applies to HVACR equipment. Emphasis is placed on power sources, interaction of electrical components, wiring of simple circuits, and the use of electrical test equipment. Upon completion, students should be able to demonstrate good wiring practices and the ability to read simple wiring diagrams.

AHR 112 Heating Technology

This course covers the fundamentals of heating including oil, gas, and electric heating systems. Topics include safety, tools and instrumentation, system operating characteristics, installation techniques, efficiency testing, electrical power, and control systems. Upon completion, students should be able to explain the basic oil, gas, and electrical heating systems and describe the major components of a heating system.

AHR 113 Comfort Cooling

This course covers the installation procedures, system operations, and maintenance of residential and light commercial comfort cooling systems. Topics include terminology, component operation, and testing and repair of equipment used to control and produce assured comfort levels. Upon completion, students should be able to use psychrometrics, manufacturer specifications, and test instruments to determine proper system operation.

AHR 114 Heat Pump Technology

Prerequisite: Take one: AHR 110 or AHR 113

This course covers the principles of air source and water source heat pumps. Emphasis is placed on safety, modes of operation, defrost systems, refrigerant charging, and system performance. Upon completion, students should be able to understand and analyze system performance and perform routine service procedures.

AHR 115 Refrigeration System

This course introduces refrigeration systems and applications. Topics include defrost methods, safety and operational control, refrigerant piping, refrigerant recovery and charging, and leak testing. Upon completion, students should be able to assist in installing and testing refrigeration systems and perform simple repairs.

AHR 125 HVACR Electronics

Prerequisite: Take One: AHR 111, ELC 111, or ELC 112

This course introduces the common electronic control components in HVACR systems. Emphasis is placed on identifying electronic components and their functions in HVACR systems and motor-driven control circuits. Upon completion, students should be able to identify components, describe control circuitry and functions, and use test instruments to measure electronic circuit values and identify malfunctions.

AHR 133 HVAC Servicing

Corequisite: Take One: AHR-112 OR AHR-113

The course covers the maintenance and servicing of HVAC equipment. Topics include testing, adjusting, maintaining, and troubleshooting HVAC equipment and record keeping. Upon completion, students should be able to adjust, maintain, and service HVAC equipment.

**AHR 151 HVAC Duct System I**

This course introduces the techniques used to lay out and fabricate duct work commonly found in HVAC systems. Emphasis is placed on the skills required to fabricate duct work. Upon completion, students should be able to lay out and fabricate simple duct work.

AHR 160 Refrigerant Certification

This course covers the requirements for the EPA certification examinations. Topics include small appliances, high pressure systems, and low pressure systems. Upon completion, students should be able to demonstrate knowledge of refrigerants and be prepared for the EPA certification examinations.

AHR 180 HVACR Customer Relations

This course introduces common business and customer relation practices that may be encountered in HVACR. Topics include business practices, appearance of self and vehicle, ways of handling customer complaints, invoices, telephone communications, and warranties. Upon completion, students should be able to present themselves to customers in a professional manner, understand how the business operates, complete invoices, and handle complaints.

AHR 211 Residential System Design

This course introduces the principles and concepts of conventional residential heating and cooling system design. Topics include heating and cooling load estimating, basic psychometrics, equipment selection, duct system selection, and system design. Upon completion, students should be able to design a basic residential heating and cooling system.

AHR 212 Advanced Comfort Systems

Prerequisite: Take AHR-114

This course covers water-cooled comfort systems, water-source/geothermal heat pumps, and high efficiency heat pump systems including variable speed drives and controls. Emphasis is placed on the application, installation, and servicing of water-source systems and the mechanical and electronic control components of advanced comfort systems. Upon completion, students should be able to test, analyze, and troubleshoot water-cooled comfort systems, water-source/geothermal heat pumps, and high efficiency heat pumps.

AHR 213 HVACR Building Code

This course covers the North Carolina codes that are applicable to the design and installation of HVACR systems. Topics include current North Carolina codes as applied to HVACR design, service, and installation. Upon completion, students should be able to demonstrate the correct usage of North Carolina codes that apply to specific areas of the HVACR trade.

AHR 215 Commercial HVAC Controls

Prerequisite: Take One: AHR-111, ELC-111, or ELC 112

This course introduces HVAC control systems used in commercial applications. Topics include electric/electronic control systems, pneumatic control systems, DDC temperature sensors, humidity sensors, pressure sensors, wiring, controllers, actuators, and controlled devices. Upon completion, students should be able to verify or correct the performance of common control systems with regard to sequence of operation and safety.

AHR 225 Commercial System Design

This course covers the principles of designing heating and cooling systems for commercial buildings. Emphasis is placed on commercial heat loss/gain calculations, applied psychometrics, air-flow calculations, air distribution system design, and equipment selection. Upon completion, students should be able to calculate heat loss/gain, design and size air and water distribution systems, and select equipment.

COM 110 Intro to Communication

This course provides an overview of the basic concepts of communication and the skills necessary to communicate in various contexts. Emphasis is placed on communication theories and techniques used in interpersonal group, public, intercultural, and mass communication situations. Upon completion, students should be able to explain and illustrate the forms and purposes of human communication in a variety of contexts. This course has been approved for transfer under the CAA/ICAA as a general education course in Communication.

**ENG 110 Freshman Composition**

Prerequisite: Take one set: Set 1: DRE 097; Set 2: ENG 002; Set 3: BSP 4002

This course is designed to develop informative and business writing skills. Emphasis is placed on logical organization of writing, including effective introductions and conclusions, precise use of grammar, and appropriate selection and use of sources. Upon completion, students should be able to produce clear, concise, well-organized short papers.

ENG 111 Writing and Inquiry

Prerequisite: Take one set: Set 1: DRE 097; Set 2: ENG 002; Set 3: BSP 4002

Corequisite: Take ENG 011

This course is designed to develop the ability to produce clear writing in a variety of genres and formats using a recursive process. Emphasis includes inquiry, analysis, effective use of rhetorical strategies, thesis development, audience awareness, and revision. Upon completion, students should be able to produce unified, coherent, well-developed essays using standard written English. This course has been approved for transfer under the CAA/ICAA as a general education course in English Composition.

MAT 110 Math Measurement & Literacy

Prerequisite: Take one set: Set 1: DMA 010 DMA 020, DMA 030; Set 2: DMA 025; Set 3: MAT 003; Set 4: BSP 4003

Corequisite: Take MAT 010

This course provides an activity-based approach that develops measurement skills and mathematical literacy using technology to solve problems for non-math intensive programs. Topics include unit conversions and estimation within a variety of measurement systems; ratio and proportion; basic geometric concepts; financial literacy; and statistics including measures of central tendency, dispersion, and charting of data. Upon completion, students should be able to demonstrate the use of mathematics and technology to solve practical problems, and to analyze and communicate results.

MAT 143 Quantitative Literacy

Prerequisite: Take one set: Set 1: DMA 010, DMA 020, DMA 030, and DRE 098; Set 2: DMA 010, DMA 020, DMA 030, and ENG 002; Set 3: DMA 010, DMA 020, DMA 030, and BSP 4002; Set 4: DMA 025 and DRE 092; Set 5: DMA 025 and ENG 002; Set 6: DMA 025 and BSP 4002; Set 7: MAT 003 and DRE 08; Set 8: MAT 003 and ENG 002; Set 9: MAT 003 and BSP 4002; Set 10: BSP 4003 and DRE 098; Set 11: BSP 4003 and ENG 002; Set 12: BSP 4003 and BSP 4002

Corequisite: Take MAT 043

This course is designed to engage students in complex and realistic situations involving the mathematical phenomena of quantity, change and relationship, and uncertainty through project- and activity-based assessment. Emphasis is placed on authentic contexts which will introduce the concepts of numeracy, proportional reasoning, dimensional analysis, rates of growth, personal finance, consumer statistics, practical probabilities, and mathematics for citizenship. Upon completion, students should be able to utilize quantitative information as consumers and to make personal, professional, and civic decisions by decoding, interpreting, using, and communicating quantitative information found in modern media and encountered in everyday life. This course has been approved for transfer under the CAA/ICAA as a general education course in Mathematics (Quantitative).

PHY 121 Applied Physics I

This algebra-based course introduces fundamental physical concepts as applied to industrial and service technology fields. Topics include systems of units, problem-solving methods, graphical analyses, vectors, motion, forces, Newton's laws of motion, work, energy, power, momentum, and properties of matter. Upon completion, students should be able to demonstrate an understanding of the principles studied as applied in industrial and service fields.

WBL 111 Work-Based Learning I

This course provides a work-based learning experience with a college-approved employer in an area related to the student's program of study. Emphasis is placed on integrating classroom learning with related work experience. Upon completion, students should be able to evaluate career selection, demonstrate employability skills, and satisfactorily perform work-related competencies.



Approved Humanities/Fine Arts Electives Associate in Applied Science Degree/Diploma		Approved Social/Behavioral Science Electives Associate in Applied Science Degree/Diploma	
ART 111	Art Appreciation	ANT 210	General Anthropology
ART 114	Art History Survey I	ANT 220	Cultural Anthropology
ART 115	Art History Survey II	ECO 151	Survey of Economics
DRA 111	Theatre Appreciation	ECO 251	Principles of Microeconomics
ENG 125	Creative Writing I	ECO 252	Principles of Macroeconomics
ENG 231	American Literature I	HIS 111	World Civilization I
ENG 232	American Literature II	HIS 112	World Civilization II
ENG 241	British Literature I	HIS 131	American History I
ENG 242	British Literature II	HIS 132	American History II
HUM 110	Technology & Society	HIS 222	African-American History I
HUM 115	Critical Thinking	HIS 223	African-American History II
HUM 120	Cultural Studies	HIS 226	The Civil War
HUM 122	Southern Culture	HIS 236	North Carolina History
HUM 150	American Women's Studies	POL 120	American Government
HUM 160	Introduction to Film	PSY 150	General Psychology
MUS 110	Music Appreciation	PSY 237	Social Psychology
MUS 112	Introduction to Jazz	PSY 241	Developmental Psychology
PHI 240	Introduction to Ethics	PSY 246	Adolescent Psychology
REL 110	World Religions	PSY 281	Abnormal Psychology
REL 211	Intro to Old Testament	SOC 210	Introduction to Sociology
REL 212	Intro to New Testament	SOC 213	Sociology of the Family
		SOC 220	Social Problems
		SOC 225	Social Diversity
		SOC 232	Social Context of Aging
		SOC 240	Social Psychology