Curriculum Standard for Air Conditioning, Heating, and Refrigeration Technology

Career Cluster: Architecture and Construction**

Cluster Description: Programs that prepare individuals to apply technical knowledge and skills related to the fields of architecture, construction, and associated professions. Includes instruction that can be applied to a variety of careers in the design-construction industry, including employment with architectural and engineering firms, residential and commercial builders/contractors, and other construction related occupations.

Pathway: Construction	**Effective Term:** Fall 2018 (2018*03)

Program Majors Under Pathway:

Program Major / Classification of Instruction Programs (CIP) Code		Credential Level(s) Offered	Program Major Code
Air Conditioning, Heating, and Refrigeration Technology	CIP Code 47.0201	AAS/Diploma/Certificate	A35100

Pathway Description:

The Air Conditioning, Heating, and Refrigeration Technology curriculum provides the basic knowledge to develop skills necessary to work with residential and light commercial systems.
Topics include mechanical refrigeration, heating and cooling theory, electricity, controls, and safety. The diploma program covers air conditioning, furnaces, heat pumps, tools and instruments. In addition, the AAS degree covers residential building codes, residential system sizing, and advanced comfort systems.
Diploma graduates should be able to assist in the start up, preventive maintenance, service, repair, and/or installation of residential and light commercial systems. AAS degree graduates should be able to demonstrate an understanding of system selection and balance and advanced systems.

Program Description: Choose one of the following ***4th paragraphs*** *to use in conjunction with the first three paragraphs of the pathway description above for documentation used to identify each* ***Program Major:***

N/A

**Within the degree program, the institution shall include opportunities for the achievement of competence in reading, writing, oral communication, fundamental mathematical skills, and basic use of computers.*

Approved by the State Board of Community Colleges on August 16, 2012; Editorial Revision 11/15/12; Editorial Revision 12/14/12; Editorial Revision 08/21/13; Editorial Revision 02/26/15; Editorial Revision 07/20/15; Prefix Addition 08/01/15; SBCC Revised 03/17/17; (GenEd MAT); Prefix Addition 04/11/18; SBCC Revised 07/20/18; CCRC Revised--Electronic Only (RISE Initiative) 10/24/19; Prefix Addition (MNT) 09/06/2023.

I. General Education Academic Core

[*Curriculum Requirements for associate degree, diploma, and certificate programs in accordance with 1D SBCCC 400.10]*: *Degree programs must contain a minimum of 15 semester hours including at least one course from each of the following areas: humanities/fine arts, social/behavioral sciences, and natural sciences/mathematics. Degree programs must contain a minimum of 6 semester hours of communications. Diploma programs must contain a minimum of 6 semester hours of general education; 3 semester hours must be in communications. General education is optional in certificate programs.*

Air Conditioning, Heating, and Refrigeration Technology

Recommended General Education Academic Core					AAS	Diploma	Certificate
Minimum General Education Hours Required:					**15 SHC**	**6 SHC**	**0 SHC**
Courses listed below are recommended general education courses for this curriculum standard. Colleges may choose to include additional or alternative general education courses to meet local curriculum needs.							
Communication:					**6 SHC**	**3-6 SHC**	**Optional**
*	COM	101	Workplace Communication	3 SHC			
	COM	110	Introduction to Communications	3 SHC			
	COM	120	Intro Interpersonal Com	3 SHC			
	COM	231	Public Speaking	3 SHC			
*	ENG	101	Applied Communications I	3 SHC			
*	ENG	102	Applied Communications II	3 SHC			
	ENG	110	Freshman Composition	3 SHC			
	ENG	111	Expository Writing	3 SHC			
	ENG	114	Prof Research & Reporting	3 SHC			
	ENG	116	Technical Report Writing	3 SHC			
Humanities/Fine Arts:					**3 SHC**	**0-3 SHC**	**Optional**
*	HUM	101	Values in the Workplace	2 SHC			
	HUM	110	Technology and Society	3 SHC			
	HUM	115	Technology and Society	3 SHC			
	HUM	230	Leadership Development	3 SHC			
	PHI	230	Introduction to Logic	3 SHC			
	PHI	240	Introduction to Ethics	3 SHC			
Social /Behavioral Sciences:					**3 SHC**	**0-3 SHC**	**Optional**
	ECO	151	Survey of Economics	3 SHC			
	ECO	251	Prin of Microeconomics	3 SHC			
*	PSY	101	Applied Psychology	3 SHC			
*	PSY	102	Human Relations	2 SHC			
	PSY	118	Interpersonal Psychology	3 SHC			
	PSY	135	Group Processes	3 SHC			
	PSY	150	General Psychology	3 SHC			
*	SOC	105	Social Relationships	3 SHC			
	SOC	210	Introduction to Sociology	3 SHC			
	SOC	215	Group Processes	3 SHC			
Natural Sciences/Mathematics:					**3 SHC**	**0-3 SHC**	**Optional**
	MAT	110	Math Measurement & Literacy	3 SHC			
	MAT	121	Algebra/Trigonometry	3 SHC			
	MAT	143	Quantitative Literacy	3 SHC			
	MAT	152	Statistical Methods I	4 SHC			
	MAT	171	Precalculus Algebra	4 SHC			
	PHY	110	Conceptual Physics	3 SHC			
	PHY	121	Applied Physics I	4 SHC			

**Recommended certificate and diploma level curriculum courses. These courses may <u>not</u> be included in associate degree programs.*

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II. Major Hours. AAS, diploma, and certificate programs must include courses which offer specific job knowledge and skills. Work-based learning may be included in associate in applied science degrees up to a maximum of 8 semester hours of credit; in diploma programs up to a maximum of 4 semester hours of credit; and in certificate programs up to a maximum of 2 semester hours of credit. Below is a description of each section under Major Hours.

A. Technical Core. The technical core is comprised of specific courses which are required for all Program Majors under this Curriculum Standard. A diploma program offered under an approved AAS program standard or a certificate which is the highest credential level awarded under an approved AAS program standard must include a minimum of 12 semester hours credit derived from the curriculum core courses or core subject area of the AAS program.

B. Program Major(s). The Program Major must include a minimum of 12 semester hours credit from required subjects and/or courses. The Program Major is in addition to the technical core.

C. Other Major Hours. Other major hours must be selected from prefixes listed on the curriculum standard. A maximum of 9 semester hours of credit may be selected from each prefix listed, with the exception of prefixes listed in the core.

Air Conditioning, Heating, and Refrigeration Technology	**AAS**	**Diploma**	**Certificate**
Minimum Major Hours Required:	**49 SHC**	**30 SHC**	**12 SHC**
A. Technical Core: *Courses required for the diploma are designated with **	**32-34 SHC**	**20-22 SHC**	

Required Courses:

*	AHR	110	Intro to Refrigeration	5 SHC
*	AHR	112	Heating Technology	4 SHC
*	AHR	113	Comfort Cooling	4 SHC
*	AHR	114	Heat Pump Technology	4 SHC

* **Electricity. Select one:**

AHR	111	HVACR Electricity	3 SHC
ELC	111	Intro to Electricity	3 SHC
ELC	112	DC/AC Electricity	5 SHC

Required Subject Areas. Select one.

For AAS degree, select one subject area plus additional courses from the prefixes listing within the same subject area for a minimum of (12) semester hours of credit:

Air Conditioning, Heating, & Refrigeration

AHR	211	Residential System Design	3 SHC
AHR	212	Advanced Comfort Systems	4 SHC
AHR	213	HVACR Building Code	2 SHC

Building Automation Systems

BAT	111	Building Automation Systems	2 SHC
BAT	221	BAS Networking	3 SHC
BAT	251	Building Automation Controls	3 SHC

Solar Thermal Systems

AHR	240	Hydronic Heating	2 SHC
ALT	250	Thermal Systems	3 SHC
PLU	111	Intro to Basic Plumbing	2 SHC

B. Program Major(s): Not Applicable

C. Other Major Hours: ***To be selected from the following prefixes:***

AHR and no more than 21 SHC selected from ALT, ARC, BAT, BPR, BUS, CIS, CMT, CSC, CST, EGR, ELC, ELN, EUS, HYD, ISC, MAT, MNT, PCI, PHY, PLU, REF, SST, WBL, WLD, and WOL

Up to two semester hour credits may be selected from ACA.

Three semester hour credits may be selected from PTE.

Up to three semester hour credits may be selected from the following prefixes: ARA, ASL, CHI, FRE, GER, IRI, ITA, JPN, LAT, POR, RUS, and SPA.

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III. Other Required Hours

A college may include courses to meet graduation or local employer requirements in a certificate (0-1 SHC), diploma (0-4 SHC), or an associate in applied science (0-7 SHC) program. These curriculum courses shall be selected from the Combined Course Library and must be approved by the System Office prior to implementation. Restricted, unique, or free elective courses may not be included as other required hours.

IV. Employability Competencies

Fundamental competencies that address soft skills vital to employability, personal, and professional success are listed below. Colleges are encouraged to integrate these competencies into the curriculum by embedding appropriate student learning outcomes into one or more courses or through alternative methods.

A. Interpersonal Skills and Teamwork – The ability to work effectively with others, especially to analyze situations, establish priorities, and apply resources for solving problems or accomplishing tasks.

B. Communication – The ability to effectively exchange ideas and information with others through oral, written, or visual means.

C. Integrity and Professionalism – Workplace behaviors that relate to ethical standards, honesty, fairness, respect, responsibility, self-control, criticism and demeanor.

D. Problem-solving – The ability to identify problems and potential causes while developing and implementing practical action plans for solutions.

E. Initiative and Dependability – Workplace behaviors that relate to seeking out new responsibilities, establishing and meeting goals, completing tasks, following directions, complying with rules, and consistent reliability.

F. Information processing – The ability to acquire, evaluate, organize, manage, and interpret information.

G. Adaptability and Lifelong Learning – The ability to learn and apply new knowledge and skills and adapt to changing technologies, methods, processes, work environments, organizational structures and management practices.

H. Entrepreneurship – The knowledge and skills necessary to create opportunities and develop as an employee or self-employed business owner.

An **Employability Skills Resource Toolkit has been developed by NC-NET for the competencies listed above. Additional information is located at: http://www.nc-net.info/employability.php*

**The *North Carolina Career Clusters Guide was developed by the North Carolina Department of Public Instruction and the North Carolina Community College system to link the academic and Career and Technical Education programs at the secondary and postsecondary levels to increase student achievement. Additional information about Career Clusters is located at: http://www.nc-net.info/NC_career_clusters_guide.php or http://www.careertech.org.*

Summary of Required Semester Hour Credits (SHC) for each credential:

	AAS	Diploma	Certificate
Minimum General Education Hours	15	6	0
Minimum Major Hours	49	30	12
Other Required Hours	0-7	0-4	0-1
Total Semester Hours Credit (SHC)	**64-76**	**36-48**	**12-18**

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