



Air Conditioning & Refrigeration (ACR)

Program Information

Air conditioning and refrigeration systems are an intricate part of the success of almost every business. Air conditioning systems are responsible for controlling the temperature, humidity, and the total air quality in residential, commercial, and industrial buildings. Refrigeration systems make it possible to store and transport food, medicine, and other perishable items. This is a skilled occupation that requires qualified technicians to install, maintain, and repair such systems.

The Air Conditioning and Refrigeration program at Trenholm State Community College is designed to teach a student the basic principles involved in the installation, maintenance, and repair of heating, air conditioning, and refrigeration systems. Through the various courses, a student will gain technical knowledge and practical hands-on experience in servicing, troubleshooting, and maintaining these systems.

Occupational Choices

Job prospects for air conditioning and refrigeration technicians are expected to be very good through the year 2024. As the population and economy grow and new residential, commercial, and industrial structures are built, more technicians will be needed to install and maintain climate control systems.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2016-2017 Edition, 2015 Survey

Average Full-Time Wage

The average full-time annual wage for an air conditioning and refrigeration technician is \$27,330 to \$68,990. These technicians enjoy a variety of employer-sponsored benefits such as health insurance and pension plans. Some employers may also pay for work-related training and provide uniforms, company vans, and tools.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2016-2017 Edition, 2015 Survey

Awards Available

Associate in Applied Science Degree
A/C & Refrigeration Technology

Associate in Applied Science Degree
A/C & Refrigeration Technology
Refrigeration Concentration

Short Term Certificate
A/C & Refrigeration Technology
Basic A/C & Refrigeration Concentration

Program Contact

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Program Coordinator/Instructor
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Location: Patterson Campus - Bldg. E

As part of ongoing planning and evaluation, the College regularly evaluates student learning outcomes for each program.

Estimated Program Length & Cost *

Award	Length	Credit Hours	Tuition Fees	Books	Tools	Supplies
Associate Degree 1	6 Terms	71	\$10,295	\$500	\$580	\$300
Associate Degree 2	6 Terms	63	\$9,135	\$500	\$580	\$300
Short Term Certificate	2 Terms	28	\$4,060	\$500	\$580	\$300

* Tax not included. Prices are subject to change without prior notice; cost of books may vary considerably among suppliers. Cost of general education books is in addition to the total listed above. The length of the program is based on full-time status of 12-15 credit hours per term. Enrollment in transitional level general education courses will alter the length of the program.

Associate in Applied Science Degree A/C & Refrigeration Technology

Required Technical Courses (49 credit hours)

Course	Title	Hrs
ACR-111	Principles of Refrigeration	3
ACR-113	Refrigeration Piping Practices	3
ACR-121	Principles of Electricity for HVACR	3
ACR-122	HVACR Electrical Circuits	3
ACR-123	HVACR Electrical Components	3
ACR-125	Fund of Gas & Electrical Htg Sys	6
ACR-128	Heat Load Calculations	3
ACR-132	Residential Air Conditioning	3
ACR-147	Refrigerant Transition and Recovery	3
ACR-152	Heat Pump Systems	6
ACR-209	Commercial A/C Systems	3
ACR-210	Troubleshooting HVACR Systems	3
ACR-127	HVACR Elect Motors	3
ACR-141	Environmental Systems	4

Required General Education (22 credit hours)

Course	Title	Hrs
CIS-146	Microcomputer Applications OR CIS-149 Intro to Computers	3
ENG-101	English Composition I	3
ENG-130	Technical Report Writing OR ENG-102 English Composition II OR SPH-106 Fund of Oral Comm	3
MTH-103	Intro to Technical Mathematics	3
MTH-104	Plane Trigonometry	3
MUS-101	Music Appreciation OR ART-100 Art Appreciation	3
ORI-101	Orientation to College	1
PSY-200	General Psychology	3

Total Hours: 71 Credit Hours; 1,824 Contact Hours

Short Term Certificate A/C & Refrigeration Technology Basic A/C & Refrigeration Concentration

Required Technical Courses (27 credit hours)

Course	Title	Hrs
ACR-111	Principles of Refrigeration	3
ACR-112	HVACR Service Procedures	3
ACR-113	Refrigeration Piping Practices	3
ACR-121	Principles of Electricity for HVACR	3
ACR-122	HVACR Electrical Circuits	3
ACR-123	HVACR Electrical Components	3
ACR-134	Ice Machines	3
ACR-147	Refrig Transition & Recovery Theory	3
ACR-133	Domestic Refrigeration	3

Required General Education (1 credit hours)

ORI-101	Orientation to College	1
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Total Hours: 28 Credit Hours; 832 Contact Hours

Associate in Applied Science Degree A/C & Refrigeration Technology Refrigeration Concentration

Required Technical Courses (41 credit hours)

Course	Title	Hrs
ACR-111	Principles of Refrigeration	3
ACR-112	HVACR Service Procedures	3
ACR-113	Refrigeration Piping Practices	3
ACR-121	Principles of Electricity for HVACR	3
ACR-122	HVACR Electrical Circuits	3
ACR-123	HVACR Electrical Components	3
ACR-133	Domestic Refrigeration	3
ACR-128	Heat Load Calculations	3
ACR-134	Ice Machines	3
ACR-147	Refrigerant Transition and Recovery	3
ACR-187	Special Topics in A/C & Refrigeration	5
ACR-203	Commercial Refrigeration	3
ACR-210	Troubleshooting HVACR Systems	3

Required General Education (22 credit hours)

Course	Title	Hrs
CIS-146	Microcomputer Applications OR CIS-149 Intro to Computers	3
ENG-101	English Composition I	3
ENG-130	Technical Report Writing OR ENG-102 English Composition II OR SPH-106 Fund of Oral Comm	3
MTH-104	Plane Trigonometry	3
MTH-103	Intro to Technical Mathematics	3
MUS-101	Music Appreciation OR ART-100 Art Appreciation	3
ORI-101	Orientation to College	1
PSY-200	General Psychology	3

Total Hours: 63 Credit Hours; 1,536 Contact Hours

Course Descriptions for A/C & Refrigeration (ACR)

Course #	Course Title	Theory Contact Hours/Wk	Lab Contact Hours/Wk	Credit Hours
ACR-111	PRINCIPLES OF REFRIGERATION	1	5	3
	PREREQUISITE: None. This course emphasizes the fundamental principles for air conditioning and refrigeration. Instruction is provided in the theory and principles of refrigeration and heat transfer, HVAC/R system components, common, and specialty tools for HVAC/R, and application of the concepts of basic compression refrigeration. Upon completion, students should identify system components and understand their functions, identify and use common and specialty HVAC/R tools, and maintain components of a basic compression refrigeration system. This is a CORE course.			
ACR-112	HVACR SERVICE PROCEDURES	1	5	3
	PREREQUISITE: None. This course covers system performance checks and refrigerant cycle diagnosis. Emphasis is placed on the use of refrigerant recovery/recycle units, industry codes, refrigerant coils and correct methods of charging and recovering refrigerants. Upon completion, students should be able to properly recover/recycle refrigerants and demonstrate safe, correct service procedures which comply with the no-venting laws.			
ACR-113	REFRIGERATION PIPING PRACTICES	1	5	3
	PREREQUISITE: None. The course introduces students to the proper installation procedures of refrigerant piping and tubing for the heating, ventilation, air conditioning and refrigeration industry. This course includes various methods of working with and joining tubing. Upon completion, students should comprehend related terminology, and be able to fabricate pipe, tubing, and pipe fittings. This is a CORE course.			
ACR-121	PRINCIPLES OF ELECTRICITY FOR HVACR	1	5	3
	PREREQUISITE: None. This course is designed to provide the student with the basic knowledge of electrical theory and circuitry as it pertains to air conditioning and refrigeration. This course emphasizes safety, definitions, symbols, laws, circuits, and electrical test instruments. Upon completion students should understand and be able to apply the basic principles of HVACR circuits and circuit components. This is a CORE course.			
ACR-122	HVACR ELECTRICAL CIRCUITS	1	5	3
	PREREQUISITE: None. This course introduces the student to electrical circuits and diagrams. Electrical symbols and basic wiring diagrams are constructed in this course. Upon completion, the student should understand standard wiring diagrams and symbols and be able to construct various types of electrical circuits. This is a CORE course.			
ACR-123	HVACR ELECTRICAL COMPONENTS	1	5	3
	PREREQUISITE: None. This course introduces students to electrical components and controls. Emphasis is placed on the operations of motors, relays, contactors, starters, and other HVAC electrical components. Upon completion, students should be able to install electrical components and determine their proper operation. This is a CORE course.			
ACR-125	FUND OF GAS & ELECTRICAL HEATING SYSTEMS	2	10	6
	PREREQUISITE: None. This course introduces students to electrical components and controls. Emphasis is placed on the operations of motors, relays, contactors, starters, and other HVAC electrical components. Upon completion, students should be able to install electrical components and determine their proper operation. This is a CORE course.			
ACR-127	HVACR ELECTRIC MOTORS	1	5	3
	PREREQUISITE: None. This course covers the basic maintenance of electric motors used in HVAC/R systems. Topics include types of motors, motor operations, motor installation, and troubleshooting motors. Upon completion student should be able to install and service HVAC/R electric motors.			
ACR-128	HEAT LOAD CALCULATIONS	3	0	3
	PREREQUISITE: None. This course focuses on heat flow into and out of building structures. Emphasis is placed on determining heat gain/heat loss of a given structure. Upon completion, students should be able to calculate heat load and determine HVAC equipment size requirements.			

Course #	Course Title	Theory Contact Hours/Wk	Lab Contact Hours/Wk	Credit Hours
ACR-132	RESIDENTIAL AIR CONDITIONING PREREQUISITE: None This course introduces students to residential air conditioning systems. Emphasis is placed on the operation, service, and repair of residential air conditioning systems. Upon completion, students will be able to service and repair residential air conditioning systems.	1	5	3
ACR-133	DOMESTIC REFRIGERATION PREREQUISITE: None This course covers domestic refrigerators and freezers. Emphasis is placed on installation, removal, and maintenance of components. Upon completion, students should be able to service and adjust domestic refrigeration units.	1	5	3
ACR-134	ICE MACHINES PREREQUISITE: None This course introduces students to commercial ice machines. Emphasis is placed on components, electrical and mechanical operation sequences, control adjustment procedures, preventive maintenance, repairs, and installation procedures. Upon completion, student should be able to install, service and repair commercial ice machines.	1	5	3
ACR-141	ENVIRONMENTAL SYSTEMS PREREQUISITE: None. This course provides students with knowledge and skills of environmental chambers. Topics include theory of the refrigerant components and refrigerant circuits, programmable controllers, electrical pressure and calibration instruments and places emphasis on safety. Upon course completion, students should be able to apply environmentally-safe practices.	2	6	4
ACR-147	REFRIGERATION TRANSITION AND RECOVERY PREREQUISITE: None. This course is EPA-approved and covers material relating to the requirements necessary for type I, II, and III universal certifications. Upon completion, students should be prepared to take the EPA 608 certification examination.	3	0	3
ACR-152	HEAT PUMP SYSTEMS PREREQUISITE: None. This course provides instruction on the operation and servicing of heat pump systems. Emphasis is placed on theory and application of refrigerants for heat pump systems and on basic service of components. Students should possess a strong foundation of electrical principles and theory. Upon completion students will be able to install and service heat pumps.	2	10	6
ACR-187	SPECIAL TOPICS IN A/C AND REFRIGERATION PREREQUISITE: None. This course provides students with opportunities to experience hands-on application of specialized instruction in various areas related to the air conditioning and refrigeration industry.	3	5	5
ACR-203	COMMERCIAL REFRIGERATION PREREQUISITE: None. This course focuses on commercial refrigeration systems. Emphasis is placed on evaporators, condensers, compressors, expansion devices, special refrigeration components and application of refrigeration systems. Upon completion students should be able to service and repair commercial refrigeration systems.	1	5	3
ACR-209	COMMERCIAL AIR CONDITIONING SYSTEMS PREREQUISITE: None This course focuses on servicing and maintaining commercial and residential HVAC/R systems. Topics include system component installation and removal and service techniques. Upon completion, the student should be able to troubleshoot and perform general maintenance on commercial and residential HVAC/R systems.	1	5	3
ACR-210	TROUBLESHOOTING HVACR SYSTEMS PREREQUISITE: None. This course provides instruction in the use of various meters and gauges used in the HVAC/R industry. Emphasis is placed on general service procedures, system diagnosis, and corrective measure, methods of leak detection, and system evacuation, charging and performance checks. Upon completion students should be able to perform basic troubleshooting of HVAC/R.	1	5	3