

# Heating, Ventilation, and Air Conditioning Technology Certificate

The certificate program is designed to prepare you for the basic job skills needed to service and maintain heating and air conditioning equipment. Students who elect to complete the certificate option learn the theory of operation and how to service, repair and design gas furnaces, central air conditioners, heat pumps, rooftop air conditioning systems, boilers, and commercial systems air conditioners. This knowledge is reinforced by working on actual equipment in the laboratory. Completion of this program will allow the student to seek employment as a maintenance and service technician in the heating/air conditioning trade.

## Suggested/Sample Course Sequence

The sequence taken by the student may vary depending on prerequisites, course availability, and personal/ professional responsibilities.

(Major Code 6230; State CIP Code 47.0201)

- Gainful Employment -HVAC (<http://www.jccc.edu/hvac/ge-hvac.html>)
- HVAC (<http://www.jccc.edu/hvac>)

### First Semester

HVAC 105	HVAC Fundamentals	4
HVAC 110	Electrical Fundamentals	4
HVAC 136	Heating System Fundamentals	3
HVAC 164	EPA 608 Refrigerant Management	1
HVAC 167	Sheet Metal Layout and Fabrication	3
INDT 155	Workplace Skills	1
Total Hours		16

### Second Semester

INDT 125	Industrial Safety/OSHA 30	3
HVAC 142	Load Calculations*	3
HVAC 201	Cooling Systems*	3
HVAC 236	Advanced Heating Applications*	3
HVAC 250	HVAC Installation and Start-up Procedures*	3
HVAC 280	HVAC Internship*	1-3
Note: Only 1 credit hour internship for certificate program.		
Total Hours		16-18

**Total Program Hours: 32**

## Courses

### HVAC 105 HVAC Fundamentals (4 Hours)

This is a beginning course in heating, ventilation and air conditioning technology that is appropriate for HVAC students. Upon successful completion of this course, the student should be able to identify the basic components of an air-conditioning system. Topics will include heat laws, refrigerants, oils and refrigeration cycles. In the lab, students will design, assemble and operate a working refrigeration system. Competencies will include brazing, wiring, evacuating and charging a system. 3 hrs. lecture/wk. and 3 hrs. lab/wk.

### HVAC 110 Electrical Fundamentals (4 Hours)

This course is in electrical theory and is required for HVAC but is appropriate for all interested students. Common electrical components found in the HVAC industry are used to develop these skills. Upon successful completion of this course, the student should be able to identify electrical components and their relationships to the various repair and troubleshooting techniques. 3 hrs. lecture/wk. and 3 hrs. lab/wk.

### HVAC 125 Energy Alternatives (2 Hours)

Upon successful completion of this course, the student should be able to identify diverse methods of alternate energy production. Some of the technologies that will be discussed are wind energy, photoelectric energy, nuclear energy, hydroelectric energy, biomass and alternate fuel vehicles. Students will understand the advantages of using various alternate energy technologies, the effects or by-products of each and the problems that might be encountered. Some student research will be included in the context of the course. Emphasis will be on the most promising or effective alternate energy technologies available. 2 hrs. lecture/wk.

**HVAC 136 Heating System Fundamentals (3 Hours)**

Upon successful completion of this course, the student should be able to identify all the components and accessories in residential heating systems. Emphasis will be on the electrical diagrams and mechanical principles. Practical instruction in service diagnostic procedures for efficient operation, maintenance and troubleshooting of these systems make up the lab portion of the course. 2 hrs. lecture/wk. and 3 hrs. lab/wk.

**HVAC 142 Load Calculations\* (3 Hours)**

**Prerequisites:** HVAC 105 or HVAC 121

Upon successful completion of this course, students will be able to perform the load calculations for residential and commercial HVAC applications. The students will be using the Air Conditioning Contractors of America (ACCA) Manual J and Manual N. 2 hrs. lecture/wk. and 3 hrs. lab/wk.

**HVAC 164 EPA 608 Refrigerant Management (1 Hour)**

The student should have a complete understanding and knowledge of the characteristics of several different types of refrigerants and the correct usage. Upon completion of this course, the student should be able to pass the examination set forth by a third-party testing facility. 1 hr. lecture/wk.

**HVAC 165 410-A Refrigerant Management (1 Hour)**

Upon completion of this course, the students should be able to understand nuances of new refrigerants on the market. The student should have a complete understanding and knowledge of the characteristics of R-410-A. Upon completion of this course, the student should be able to pass the examination set forth by a third-party testing facility. 1 hr. lecture/wk.

**HVAC 167 Sheet Metal Layout and Fabrication (3 Hours)**

Upon successful completion of this course, the student should be able to identify the components, equipment and operation for sheet metal layout and fabrication. Practice problems are included at the end of each unit in order to provide the student with an opportunity to apply the methods attained by sheet metal layout. Shop facilities are available. The patterns will be fabricated and joined into a line of fittings. This gives the most complete test of pattern accuracy and also provides the experience needed by a competent layout person. The student will be required to provide ANSI Z87 safety glasses and may be expected to provide other basic hand tools and/or equipment. 2 hrs. lecture, 3 hrs. lab/wk.

**HVAC 201 Cooling Systems\* (3 Hours)**

**Prerequisites:** (HVAC 105 or HVAC 121) AND (HVAC 110 or HVAC 123)

Upon successful completion of this course, the student should be able to identify all the components and accessories and their relationship to the functions of residential and commercial air conditioning and heat pump systems. Topics covered will include air conditioner condensing units, metering devices, evaporation coils and refrigerants. 2 hrs. lecture/wk. and 3 hrs. lab/wk.

**HVAC 231 HVAC Rooftop Units\* (3 Hours)**

**Prerequisites:** (HVAC 105 or HVAC 121) AND (HVAC 110 or HVAC 123)

Topics will include electrical controls and economizers of various rooftop units, roof curbs, installation, service, diagnosis, evacuation and charging of typical light commercial rooftop units. The student will be required to provide ANSI Z87 safety glasses and may be expected to provide other basic hand tools and/or equipment. 2 hrs. lecture and 3 hrs. lab/wk.

**HVAC 236 Advanced Heating Applications\* (3 Hours)**

**Prerequisites:** (HVAC 105 or HVAC 121) AND (HVAC 110 or HVAC 123) AND (HVAC 136 or HVAC 127)

Upon successful completion of this course, the student will be able to identify all the components and accessories of furnaces, heat pumps or boiler systems that are used either in residential or commercial spaces. The student should also be able to demonstrate familiarity with aspects of fuel gas piping, gas appliance venting, water heater installations, combustion air requirements and proper piping techniques. 2 hrs. lecture/wk. and 3 hrs. lab/wk.

**HVAC 242 Duct Design and Equipment Selection\* (3 Hours)**

**Prerequisites:** HVAC 105 or HVAC 121

Upon successful completion of this course, the student should be able to determine proper sizing of residential HVAC equipment and duct work to meet the requirements for high-quality climate control systems. 2 hrs. lecture/wk. and 3 hrs. lab/wk.

**HVAC 250 HVAC Installation and Start-up Procedures\* (3 Hours)**

**Prerequisites or corequisites:** (HVAC 201 or HVAC 221) AND (HVAC 236 or HVAC 223)

Upon successful completion of this course, the student will be able to identify techniques and procedures to install new systems and retrofit systems. Topics include initial start-up, maintenance of furnaces and air conditioners, electrical requirements, permits and inspections, combustion air, sheet metal and applying mechanical standards. 2 hrs. lecture/wk. and 3 hrs. lab/wk.

**HVAC 275 HVAC Code Review\* (3 Hours)**

**Prerequisites:** . (HVAC 142 or HVAC 124) AND (HVAC 201 or HVAC 221)

**Prerequisites or corequisites:** HVAC 136 or HVAC 127

This course is for the use and interpretation of the current International Mechanical Code (IMC). Upon successful completion of this course, the student should be able to interpret and apply the Code to HVAC applications. 3 hrs. lecture/wk.

**HVAC 277 HVAC Control Systems\* (3 Hours)**

**Prerequisites:** . HVAC 201 or HVAC 221

**Prerequisites or corequisites:** HVAC 236 or HVAC 223

Upon successful completion of this course, the student should be able to identify the components and theory in electronic, pneumatic and direct digital control systems. Classroom topics will center on components, wiring diagrams, calibration and sequences of operation, system components, theory of operation, wiring diagrams and installation methods. 2 hrs. lecture/wk. and 3 hrs. lab/wk.

**HVAC 280 HVAC Internship\* (1-3 Hour)**

**Prerequisites:** Department approval

Upon successful completion of this course, the student should be able to apply classroom knowledge to an actual work environment. The internship will provide the students with an on-the-job experience under the supervision of industry professionals. The work will be developed in cooperation with area employers, college staff and each student to provide a variety of actual job experiences directly related to the student's career goals in the HVAC field. Minimum 15 hrs. per week on-the-job training.