



Climate & Energy Control Technologies

Organization Washburn Institute of Technology

Program Number 47.0201

Instructional Level Certificate

Target Population

Grades 11 & 12
Post-secondary

Description

The Climate and Energy Control Technology program presents technical training to students in the areas of electricity, heating, residential air conditioning, refrigeration, sheet metal fabrication, direct digital controls (DDC) & commercial HVAC applications. This program provides students with industry credentialing in the areas of refrigerant handling safety, tool usage and control fundamentals. Foundational skills and principles learned in this program prepare students to work in the commercial and residential HVAC market place.

Entry Requirements

WorkKeys®	Applied Math	Level 6
WorkKeys®	Reading for Information	Level 5

Assessment Plan

Assessment is an integral part of the educational process at Washburn Tech and accurate feedback is an important tool in continuously improving the institution's technical programs. Students can expect to participate in assessment activities prior to entry into programs, within specific courses and following program completion for specific fields of study.

Student Learning Outcomes

- A. Communicate effectively.
- B. Integrate technology.
- C. Learn effectively - use academics effectively.
- D. Demonstrate cooperative/teamwork skills.
- E. Apply safety.
- F. Think critically and creatively.
- G. Demonstrate responsible work ethics.

Program Outcomes

- A. Apply knowledge of electrical fundamentals.
- B. Apply knowledge of Mechanical Code.
- C. Apply knowledge of HVACR theory.
- D. Demonstrate proper tool use.
- E. Demonstrate industry expectations for safety and professionalism.
- F. Apply knowledge of control theory.

Course #	Course Title	Credit Hours	Required
CEC105	Workplace Skills	1	Yes
CEC110	Safety Orientation/.OSHA 10	1	Yes
CEC115	Electrical Fundamentals	4	Yes
CEC116	Electrical Fundamentals II	1	Yes
CEC205	HVAC Fundamentals	4	Yes
CEC120	Heating System Fundamentals	3	Yes
CEC125	Advanced Electrical Theory for HVAC	2	Yes
CEC126	Advanced Heating Systems	3	Yes
CEC135	Sheet Metal Fabrication I	3	Yes
CEC200	Heat Loads and Duct Sizing	4	Yes
CEC121	Heating System Fundamentals II	2	Yes
CEC210	EPA 608	1	Yes
CEC215	Intro to Mechanical Refrigeration	4	Yes
CEC225	Heat Pumps	3	Yes
CEC230	Commercial HVAC	4	Yes
CEC235	Commercial HVAC Lab	4	Yes

Program Course Descriptions

CEC105 Workplace Skills (1 credits)

Upon successful completion of this course, the student should be able to identify the job skills necessary to have a successful career in the field of their choice. Topics included listening skills, oral communication, human relations, decision making/problem solving, how to work as a team, time and resource management, work ethics, career planning and resume building.

CEC110 Safety Orientation/OSHA (1 credits)

Safety Orientation/OSHA 10 provides the student with an overview of the OSHA standards relevant to the construction industry. Various topics are presented in a 15-hour format. Among the subjects covered in the course are: an introduction to OSHA, electrical safety, fall protection, and excavation and trenching safety.

CEC115 Electrical Fundamentals (4 credits)

The student will receive instruction in basic electrical theory for DC and Alternating Current systems. The student will have knowledge on the production of electricity and how to apply Ohm's Law and Power Formula. Electrical safety is taught along with skills in how to read and interpret schematic diagrams. This class must be passed with a minimum of a C or 78% for the student to continue to next course.

CEC116 Electrical Fundamentals II (1 credits)

Students will be introduced to motor theory and explore motor applications. This course builds on previous knowledge gained in Electrical Fundamentals I and requires a firm understanding of magnetism and voltage production. Motor trouble shooting will be introduced. Types of motors covered will be single phase motors, three phase and ECM motors. This class must be passed with a minimum of a C or 78% for the student to continue to next course.

CEC120 Heating System Fundamentals (3 credits)

This course will give students a firm understanding of combustion and how it is applied in the HVAC trade. Residential gas furnaces will be studied in detail in order to gain understanding in how they are installed and serviced. A thorough understanding of Standard, Midrange and High Efficiency furnace service and installation will be earned as a result of this course. This class must be passed with a minimum of a C or 78% for the student to continue to next course.

CEC121 Heating System Fundamentals II (2 credits)

The heating System Fundamentals II course is designed to walk student through the requirements of the Uniform Mechanical Code in relation to Gas Piping and exhaust ventilation. Student will gain a thorough understanding and be able to apply skills in sizing vents and pipe upon completion of this course.

CEC125 Advanced Electrical Theory for HVAC (2 credits)

Advanced Electrical Theory for HVAC is a continuation of Electrical Fundamentals and places an emphasis on developing systematic diagnosis and troubleshooting methods and procedures that will enable the student to become a highly-skilled, professional HVAC-R service technician.

CEC126 Advanced Heating Systems (3 credits)

This course will introduce students to electric furnaces and hydronic heating with an emphasis on the electrical systems of those units and code requirements for the safe installation of such equipment. Indoor air quality will be discussed in detail as a major factor in human comfort.

CEC135 Sheet Metal Fabrication I (3 credits)

This course focuses on sheet metal fabrication utilizing various sheet metal tools and techniques. Duct sizing is discussed in addition to code requirements for duct systems.

CEC200 Heat Loads and Duct Sizing (4 credits)

The course will teach students to analyze heat flow characteristics as they study heat loss and heat gain factors as it pertains to residential HVAC design. Topics will include the effects of selected materials and the layout of the system for the purpose of trouble shooting, load estimation and duct sizing.

CEC205 HVAC Fundamentals (4 credits)

This course is designed to introduce students to the broader picture that is HVAC. Students will become familiar with trade related organizations, job requirements, gain skills in soldering and brazing, and demonstrate learned skills to service and repair air conditioning systems. Students must earn a C grade or better in this course in order to advance to the next course.

CEC210 EPA 608 (1 credits)

Students will be certified in federal regulations of safe refrigerant handling practices. Successful completion of the certification course is required for technicians to work with and purchase refrigerants.

CEC215 Intro to Mechanical Refrigeration (4 credits)

The students will apply knowledge previously learned in HVAC Fundamentals to ice machines, refrigerators and commercial coolers. Students will learn the function of the specialized electrical circuits and how to service and repair these systems.

CEC225 Heat Pumps (3 credits)

The student will learn the basic functions of various Heat Pump design as well as charging and troubleshooting procedures.

CEC230 Commercial HVAC (4 credits)

This course will introduce students to the commercial applications of various HVAC systems. A strong foundation in refrigeration theory is required as well as a comprehensive understanding of system airflow and electrical fundamentals. Students who complete this course will be skilled in reading advanced electrical schematics and be able to describe the function and application of various commercial systems and components including Direct Digital Control systems and frequency drives. This is a capstone course.

CEC235 Commercial HVAC Lab (4 credits)

This course continues the introduction to Commercial HVAC systems through hands-on training. Students will be performing basic maintenance, repairs and troubleshooting on functioning light commercial and commercial equipment.

Disability:

The Americans with Disabilities Act (ADA) Office is responsible for assisting in arranging accommodations and for identifying resources at Washburn Institute of Technology for persons with disabilities. Qualified students with disabilities MUST self-identify by completing an application. In addition students must provide appropriate medical documentation to the ADA coordinator to be eligible for accommodations. New requests for accommodations should be submitted at least two months or more prior to the date the accommodations are needed. However, please contact the ADA office as soon as a need may arise. Depending on the accommodation request, four to eight weeks lead time may be needed for timely and effective provision of accommodations.

The ADA Office coordinates and assists in arranging accommodations it deems appropriate for eligible students on a case-by-case basis. If you are a student with a disability that may substantially limit your ability to participate in any of our classes and you believe that you will need accommodations, it is your responsibility to contact: ADA Coordinator, 785.670.3365 or Gloria.christian@washburn.edu.

Washburn University [prohibits discrimination](#) on the basis of race, color, religion, age, national origin, ancestry, disability, sex, sexual orientation, gender identity, genetic information, veteran status, or marital or parental status. The following person has been designated to handle inquiries regarding the non-discrimination policies: Dr. Pamela Foster, Equal Opportunity Director/Title IX Coordinator, Washburn University, 1700 SW College Ave, Topeka, Kansas 66621, 785.670.1509, eodirector@washburn.edu