HEATING, VENTILATION, AIR CONDITIONING, AND REFRIGERATION (HVACR)

HVACR 1100
Refrigeration Principles
3 Credit Hours
Introduction to basic principles of refrigeration, basic laws of matter, fluids, gases, compression systems, refrigeration controls, refrigerants, and components. Also introduces service practices including the use of a refrigeration service manifold, recovery, vacuuming, and charging a system. (2 lecture hours, 2 lab hours)

HVACR 1105
Introduction to Safety, Materials and Equipment
3 Credit Hours
Introduction to general safety practices, tool safety, the use and care of hand tools, specialty tools used in the Heating Ventilation, Air Conditioning, and refrigeration(HVACR) industry, pipe fitting basics, tubing and connection methods, brazing and soldering, and a variety of other basics needed to be successful in the HVACR industry. (2 lecture hours, 2 lab hours)

HVACR 1108
Refrigerant Certification
1 Credit Hour
Environmental handling, refrigerant equipment and certification types are covered. Federal Government requires all individuals who open a system or container holding refrigerant to be certified. EPA refrigerant certification test given. (1 lecture hour)

HVACR 1110
Introduction to Electricity and Hvacr Controls
3 Credit Hours
Practical study of electricity, electrical hardware, and electrical test instruments that are used in the heating, ventilation, air conditioning and refrigeration industry. Students will be introduced to: basic electricity, circuits, schematics, power distribution, electrical components, and motors. (2 lecture hours, 2 lab hours)
Course types: Contemporary Life Skills (A.A., A.S., A.A.S., A.G.S.)

HVACR 1112
Residential Refrigeration
3 Credit Hours
Analysis of the operation of refrigeration systems, leak detection, leak repair, charging, component, replacements, schematic reading and troubleshooting domestic refrigerator and window air conditioning units. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, and HVACR 1110 or consent of instructor.

HVACR 1161
Introduction to Sheet Metal
2 Credit Hours
Basic fitting layouts. Various types of seams, elbows and triangulation used in constructing various square and round fittings. Drawing and fabrication of the fittings are required. (4 lab hours)

HVACR 1180
Introduction to Heating
5 Credit Hours
Gas combustion, venting, operation of a heating unit, electrical circuitry, zoning and accessories. Servicing, troubleshooting and repairing mechanical and electrical components, and proper installation of heating units. (4 lecture hours, 2 lab hours)
Prerequisite: HVACR 1110 or consent of instructor.

HVACR 1181
Heating Principles
3 Credit Hours
Introduction to heating systems and equipment used in the Heating Ventilation, Air Conditioning, and Refrigeration (HVACR) industry. The course will introduce students to residential and light commercial forced-air systems, hydronic boilers, low pressure and high pressure steam boilers, electric heating, components, sequences of operation, and venting. (2 lecture hours, 2 lab hours)

HVACR 1820
Selected Topics
1-5 Credit Hours
Introductory exploration and analysis of selected topics with a specific theme indicated by course title listed in college class schedule. This course may be taken four times for credit as long as different topics are selected. (0 to 5 lecture hours, 0 to 10 lab hours)

HVACR 1827
Selected Topics
1 Credit Hour
Introductory exploration and analysis of selected topics with a specific theme indicated by course title listed in college class schedule. This course may be taken four times for credit as long as different topics are selected. (1 lecture hour)

HVACR 1840
Independent Study
1-4 Credit Hours
Exploration and analysis of topics within the discipline to meet individual student-defined course description, goals, objectives, topical outline and methods of evaluation in coordination with and approved by the instructor. This course may be taken four times for credit as long as different topics are selected. (2 to 8 lab hours)
Prerequisite: Consent of instructor is required.

HVACR 2110
Facility Electrical Systems
3 Credit Hours
Advanced facility electrical systems and controls. Cover electrical control and design of mechanical facility systems. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1110 with a grade of C or better, or equivalent, or consent of instructor.

HVACR 2180
Residential and Light Commercial Forced-Air Heating
3 Credit Hours
Advanced course covering forced-air furnaces in residential and light-commercial applications. Covers installation, components, sequence of operation, maintenance, and electrical and mechanical troubleshooting of mid-efficiency, high-efficiency (condensing), and modulating forced-air furnaces. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1110 and HVACR 1181, both with a grade of C or better, or equivalent, or consent of instructor.

HVACR 2186
Hydronic Heating
3 Credit Hours
Hot water heating systems including residential and light commercial applications. Piping systems and components are also covered. (2 lecture hour, 2 lab hours)
Prerequisite: HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better, or equivalent or consent of instructor.

HVACR 2187
Central Heating Plants
3 Credit Hours
Theory of large boiler systems operation. Low and high pressure boilers, air handling equipment, heat exchangers, pumps, controls, water treatment, accessories, service and preventive maintenance are covered. Field trips to central heating plants are included. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1110 and HVACR 1181, both with a grade of C or better, or equivalent.

HVACR 2201
Residential Air Conditioning
3 Credit Hours
Course includes residential air conditioning topics: Split air-conditioning systems, proper installation, evaluation, operation, servicing, repair of mechanical and electrical components, and air analysis. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, and HVACR 1110 with a grade of a C or better, or equivalent, or consent of instructor.

HVACR 2202
Commercial Air Conditioning
3 Credit Hours
An advanced course covering commercial air-conditioning equipment and mechanical and electrical components of rooftop heating and cooling systems. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110 and HVACR 1181, all with a grade of C or better or consent of instructor.

HVACR 2205
Heat Pumps
2 Credit Hours
Theory of the refrigeration cycle with respect to heat pumps and electrical heat. Includes mechanical and electrical operation, service, repair and proper installation. (1 lecture hour, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, and HVACR 1110 or consent of instructor.

HVACR 2210
Commercial Refrigeration
5 Credit Hours
High, medium, and low temperature refrigeration application, operation of mechanical and electrical components, service and repair of electrical circuitry, and mechanical components, capacity controls, walk-ins, reach-ins, ice machines, supermarket refrigeration equipment, refrigeration piping, heat reclaim, and start-up procedures. (4 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, and HVACR 1110 or consent of instructor.

HVACR 2220
Installation
3 Credit Hours
Installation of heating, air conditioning and refrigeration systems, piping, duct installation, electrical circuitry, and accessories. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better or consent of instructor.

HVACR 2225
Troubleshooting Systems
3 Credit Hours
Systematic evaluation of system pressure, temperature, compressor efficiency, mechanical, and electrical components. Study of system performance on live equipment. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better or consent of instructor.

HVACR 2230
HVACR Control Systems
3 Credit Hours
Heating, Ventilation, Air Conditioning and Refrigeration (HVACR) control systems in commercial buildings: All-Air, All-Water, and Air-Water systems. Includes electric, pneumatic, electronic and an introduction to Direct Digital Control (DDC) controls. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better or consent of instructor.

HVACR 2231
Building Automation Control Devices
3 Credit Hours
Examines building HVACR, lighting, security, access, plumbing, fire protection, elevator, voice-data-video systems. Content includes control components, hardware, operation, and signaling used in an integrated building automation system. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better or consent of instructor.

HVACR 2232
Energy Audits/Economics
2 Credit Hours
Purpose, objectives and mechanics of the energy audit and economic processes include the audit procedures, heating, ventilation, air conditioning, and refrigeration systems, lighting, auxiliary equipment, energy conserving, cost-saving measures and analysis techniques that are necessary for evaluation of energy projects. After successful completion of the course, students are eligible to take the Environmental Protection Agency (EPA) Refrigerant Certification Test. (1 lecture hour, 2 lab hours)

HVACR 2233
Bldg Automation Systems With Object-Oriented Programming I
3 Credit Hours
An introduction to Building Automation Control network (BACnet) and Local Operating Network (LON) protocols using Object-Oriented Programming (OOP) in the building automation industry. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better or equivalent or consent of instructor.

HVACR 2234
Bldg Automation Systems With Object-Oriented Programming II
3 Credit Hours
Advanced Object-Oriented Programming (OOP) applied to Direct-Digital Controls (DDC) used in Building Automation Systems (BAS). Covers sequence of operation and control strategies of DDC controllers used in building automation systems. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 2230, HVACR 2231, HVACR 2233, and HVACR 2238, all with a grade of C or better, or equivalent or consent of instructor.

HVACR 2235
Building Commissioning
3 Credit Hours
Explores the history and development of building commissioning. Includes types of commissioning, responsibilities of commissioning agents, instruments, building automation systems, types of reports, and functional testing. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 2230 and HVACR 2231, both with a grade of C or better, or equivalent or consent of instructor.

HVACR 2236
Central Cooling Plants
3 Credit Hours
Theory of centrifugal, absorption and screw systems, minor repairs, service, preventive maintenance of pumps, air-handling equipment and controls are covered. Field trips to central cooling plants are included. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, and HVACR 1110 or equivalent.

HVACR 2237
Building Automation Systems Solutions
3 Credit Hours
Explores different manufacturers of Direct Digital Controls (DDC) and systems used in building automation. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 2230, HVACR 2231, HVACR 2233, and HVACR 2238, all with a grade of C or better, or equivalent or consent of instructor.

HVACR 2238
Building Automation System Integration with Open Protocols
3 Credit Hours
Examines control concepts and network data communication using LonWorks (local operating networks) and BACnet (building automation controls network) protocols. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better, or equivalent or consent of instructor.

HVACR 2240
Load Calculations and Duct Design
5 Credit Hours
Techniques and procedures necessary to evaluate residential and commercial heat loss, heat gain and duct layout design. Heat transmission, infiltration, R-value, U-valve, duct analysis, duct sizing, duct and register location and selection, and equipment sizing and selection. (4 lecture hours, 2 lab hours)

HVACR 2241
Industrial Air Conditioning Design
3 Credit Hours
Design and application of industrial air conditioning, psychrometrics, load calculation, equipment selection, ventilation, duct design, pipe design, and automatic controls. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 2240 and MATH 1100 or MATH 1115 (or college equivalent) or qualifying score on the mathematics placement test, or consent of instructor.

HVACR 2242
Mechanical Systems
3 Credit Hours
Introduces students to mechanical concepts of measurement, pipe fittings, pipe dimensions, shaft and pulley alignment, pumping concepts, pump maintenance, introduction to fluid dynamics, and systems integration of mechanical facility and industrial systems. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1105 with a grade of C or better, or equivalent or MANUF 1151 with a grade of C or better, or equivalent or WELD 1100 with a grade of C or better, or equivalent or consent of instructor.

HVACR 2250
System Balancing
3 Credit Hours
Covers air-delivery equipment, duct distribution, duct pressure, cubic feet per minute, fluid flow, pumps, piping, refrigeration systems, testing instruments, and fine tuning of systems. (2 lecture hours, 2 lab hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better or consent of instructor.

HVACR 2260
Heating and Air Conditioning Contracting
3 Credit Hours
Application of the HVACR design and implementation procedure, with emphasis on the equipment selection process, as outlined in Air Conditioning Contractors of America (ACCA) Manuals S and CS, Residential and Commercial Equipment Selection. Best practices for residential and light commercial HVACR contractors and designers, including identifying and incorporating recognized industry practices into business operations. (3 lecture hours)
Prerequisite: HVACR 1100, HVACR 1105, HVACR 1110, and HVACR 1181, all with a grade of C or better, and concurrent enrollment in MANAG 2210 or consent of instructor.

HVACR 2860
Internship (Career &Technical Ed)
1-4 Credit Hours
Course requires participation in Career and Technical Education work experience with onsite supervision. Internship learning objectives are developed by student and faculty member, with approval of employer, to provide appropriate work-based learning experiences. Credit is earned by working a minimum of 75 clock hours per semester credit hour, up to a maximum of four credits. (5 to 20 lab hours)
Prerequisite: Consent of instructor and 2.0 cumulative grade point average; 12 semester credits earned in a related field of study; students work with Career Services staff to obtain approval of the internship by the Dean from the academic discipline where the student is planning to earn credit.
Course types: Contemporary Life Skills (A.A., A.S., A.A.S., A.G.S.)

HVACR 2862
Internship (career & Technical Ed)
2 Credit Hours
Course requires participation in Career and Technical Education work experience with onsite supervision. Internship learning objectives are developed by student and faculty member, with approval of employer, to provide appropriate work-based learning experiences. Credit is earned by working a minimum of 75 clock hours per semester credit hour, up to a maximum of four credits. (10 lab hours)
Prerequisite: Consent of instructor and 2.0 cumulative grade point average; 12 semester credits earned in a related field of study; students work with Career Services staff to obtain approval of the internship by the Dean from the academic discipline where the student is planning to earn credit.
Course types: Contemporary Life Skills (A.A., A.S., A.A.S., A.G.S.)

HVACR 2865
Internship Advanced (Career & Tech Ed)
1-4 Credit Hours
Continuation of Internship (Career & Technical Ed). Course requires participation in Career & Technical Education work experience with onsite supervision. Internship learning objectives are developed by student and faculty member, with approval of employer, to provide appropriate work-based learning experiences. Credit is earned by working a minimum of 75 clock hours per semester credit hour, up to a maximum of four credits. (5 to 20 lab hours)
Prerequisite: Consent of instructor and 2.0 cumulative grade point average; 12 semester credits earned in a related field of study; students work with Career Services staff to obtain approval of the internship by the Dean from the academic discipline where the student is planning to earn credit.
Course types: Contemporary Life Skills (A.A., A.S., A.A.S., A.G.S.)