

HVACR SYSTEMS SERVICING (SERV)

SERV1110 | HVAC Electrical I | Lecture/Laboratory (2 Credits)

Basic electrical terminology and theory. Introduction to simple circuit construction. Basic electrical properties and their effects on circuits. Load capacity for wiring and fuses. Simple circuit diagramming. Theory of electrical generation through magnetism and electromagnetism. Analyzing and testing circuits with various test equipment.

SERV1120 | Heating Systems I | Lecture/Laboratory (3 Credits)

Basic fundamentals and terminology pertaining to heat transfer. Thermal environmental science properties. Latent and sensible heat, conduction, convection and radiation. Fundamental psychrometrics. Air distribution, room air movement characteristics and the fundamentals of balancing air systems. Analyzing static, velocity and total pressure along with airflow measurements within ductwork.

SERV1130 | Residential Controls I | Lecture/Laboratory (2 Credits)

Introduction to basic environmental controls with an emphasis on theory, application, and practical installation. Principles of Effective Temperature will be applied to various temperature, humidity, and air movement controls. Basic control of secondary circuits including transformers, relays, and contactors used in the operation of heating and cooling equipment. Sketch, diagram, and wire basic secondary control circuits. Job safety.

Prerequisite(s): SERV1110

SERV1140 | Basic Motor Technology | Lecture/Laboratory (3 Credits)

Theory of magnetism and circuitry as it pertains to the induction motor. Introduction to fundamental types of motors used in the HVAC field. Wiring of various power and control circuits. Introduction to the relay, contactor and motor starter. Motor usage and service problems encountered in the field. Electrical diagramming and schematics. Troubleshooting motor circuits. Motor nomenclature and safety.

Prerequisite(s): SERV1110

SERV1150 | Cooling Systems I | Lecture/Laboratory (3 Credits)

Basic fundamentals of cooling as it pertains to HVAC&R systems. Gas laws and the principles of the basic refrigeration cycle. Skills pertaining to refrigeration: tubing handling, flaring, swedging, soft and hard soldering and brazing. Introduction to refrigerants and refrigerant management.

Prerequisite(s): SERV1120

SERV1210 | Heating Systems II | Lecture/Laboratory (3 Credits)

Heat generation as it pertains to residential furnaces. Natural and LP gases. Furnace types, sequence of operation, component identification, ignition types, test equipment and safety. Troubleshooting pertaining to the mechanical operation and the electrical control functions of gas furnaces. Diagnostic skills to meet service problems encountered in the field. Combustion testing and job safety.

Prerequisite(s): SERV1110, SERV1130, And SERV1140

SERV1220 | Cooling Systems II | Lecture/Laboratory (3 Credits)

Fundamentals of residential air conditioning. Evacuation principles and procedures for deep vacuums. Basic split system air conditioning systems wiring and controls examined and diagrammed in schematics. Refrigerant chemistry examined. Refrigerant recycling, recovery, and management reviewed in accordance with EPA standards. Systematic refrigerant charging procedures determined and validated through hands-on guidance using actual equipment. Basic cooling analysis through psychrometrics and pressure-enthalpy processes. Job safety.

Prerequisite(s): SERV1110, SERV1130, SERV1140, And SERV1150

SERV1230 | HVAC Electrical II | Lecture/Laboratory (2 Credits)

Introduction to semiconductors and elementary solid-state circuits used in HVACR control circuits. Electrical schematics for HVACR secondary and load circuitry. Fundamental operation and wiring of motor starter secondary and load circuits examined, diagrammed, and wired. Electronic theory applied to electronic air cleaners, electronically commutated motors, and digital temperature controls. Continued application of relays, and contactors developed in lab jobs and servicing situations encountered in the field. EPA Section 608 Technician Certification test review and exam (required). Job safety.

Prerequisite(s): SERV1110

SERV1240 | Heating Systems III | Lecture/Laboratory (2 Credits)

Introduction to forced air, oil burning, and electric furnaces. Evaluation of gas, oil, and electric furnace sequences of operation coupled with combustion analysis. Practice of start up procedures and combustion testing processes. Mechanical and electrical applications using wiring diagrams and schematics. Diagnostic skills of mechanical, combustion, and electrical problems encountered in the field. Job safety.

Prerequisite(s): SERV1110, SERV1120, SERV1130, SERV1140, SERV1210, And SERV1230

SERV1250 | Cooling Systems III | Lecture/Laboratory (3 Credits)

Advanced residential air conditioning and air-to-air heat pump systems. Theory and troubleshooting of heat pumps. Application and operation of air conditioning and heat pump controls examined. Wiring diagrams and schematics examined and evaluated. Hydrocarbon Refrigerants certification test review and exam (required). Introduction to customer relations skills with a focus on occupational professionalism. Job safety.

Prerequisite(s): SERV1110, SERV1120, SERV1130, SERV1140, SERV1220, And SERV1230

SERV2110 | Domestic Refrigeration | Lecture/Laboratory (2 Credits)

Examine the mechanical refrigeration cycle as it pertains to domestic refrigerators, freezers, room air conditioners, and residential dehumidifiers. Topics include system controls and component troubleshooting and repair, electrical schematic interpretation and diagramming, analysis of refrigerant and electrical components for proper operation and temperature control, as well as job safety.

Prerequisite(s): SERV1240 And SERV1250

SERV2121 | Commercial Refrigeration I | Lecture/Laboratory (3 Credits)

Investigate the operation, maintenance, troubleshooting, and repair of restaurant product cooling equipment. Topics include a diverse cross section of ice maker, reach-in refrigerator, and freezing refrigeration equipment. Examine methods of defrost, electronic and mechanical refrigeration and temperature controls. Interpret and analyze schematics and diagrams. Apply refrigerant recovery and charging procedures. Job safety standards are applied.

SERV2131 | Commercial Refrigeration II | Lecture/Laboratory (3 Credits)

Analyze the operation, maintenance, troubleshooting, and repair of commercial product cooling equipment. Topics include: walk-in coolers, walk-in freezers, light commercial, and supermarket refrigeration equipment and operation. A variety of refrigeration controls, both electrical and mechanical are examined along with methods of defrost and heat recovery. Identify refrigeration pipe and equipment sizing, as well as electrical schematics and diagramming. Job safety standards are applied.

SERV2140 | HVAC Commercial Controls I | Lecture/Laboratory (3 Credits)

Examine the fundamentals of commercial HVAC controls. Control conceptions include pneumatic and DDC control functions with the inclusion of building energy management systems for an environmentally green HVAC setting. Demonstrate the application of these controls along with variable frequency drives, air handler, multi-zoning, VAV systems and economizers in a variety of hands-on experiments. Job safety standards are applied.

SERV2150 | HVAC Piping & State Mechanical Code | Lecture/Laboratory (2 Credits)

Introduction to the State of Minnesota Mechanical and Energy Codes. Topics emphasized are: refrigeration, gas piping, venting, steam and hydronic system installation codes. Hands-on labs include fabrication of copper, iron, steel, and pex piping. Job safety standards are applied.

SERV2210 | HVAC Commercial Controls II | Lecture/Laboratory (3 Credits)

Examine three phase power supplies, motor starters, environmental controls, magnetic contactors, and relays used in the commercial HVAC equipment environment. Other topics include: combustion analysis, ventilating exhaust PRV and make-up air equipment and requirements. Industrial heating burner controls and safeties are diagrammed and developed in hands-on lab experiments. Job safety standards are applied.

SERV2231 | Metal Fabrication | Lecture/Laboratory (3 Credits)

Practice metal fabrication skills with a focus on oxyacetylene and wire feed welding. Topics include layout and construction of common sheet metal components found in residential HVAC systems. Job safety standards are applied.

SERV2240 | Steam & Hydronic Heating | Lecture/Laboratory (3 Credits)

Examine steam and hydronic heating systems, both residential and commercial. Topics include: high and low pressure boilers and accessories, including code requirements; and maintenance, troubleshooting and repair practices. Introduction to steam and hydronic boiler controls, safety and component parts in hands-on labs. Prepares student for the State of Minnesota Special Engineers license exam. Job safety standards are applied.

SERV2250 | Commercial Air Conditioning | Lecture/Laboratory (2 Credits)

Explore water-cooled chiller and computer room air conditioning technology and an examination of the compressors that run them. The focus is on HVAC packaged unit (RTU) installation, start up, check out, combustion analysis, and troubleshooting procedures. Job safety standards are applied.