HEATING, VENTILATION, AIR CONDITIONING AND REFRIGERATION (HVAC/R)

The Heating, Ventilation, Air Conditioning and Refrigeration Department prepares students for employment in the field of heating, ventilation, air conditioning and refrigeration. The employment opportunities in this field are expected to increase during the next decade due to the need to increase energy efficiencies of this equipment and incorporating building automation network and programming. Air conditioning in offices, stores, hospitals, schools and other non-residential buildings has become commonplace. Refrigeration is also necessary for the production, storage, and marketing of food and other perishables.

Contact Information

Division: Applied Technology, Transportation, and Culinary Arts (T - 108)

Division Phone Number: (909) 384-4451

Faculty Chair: Tarif (Terry) Halabi (thalabi@sbccd.edu), M.S.E.E.

Counselor Liaisons: Debbie Orozco (dorozco@sbccd.edu), M.A. and Patricia Jones (pjones@sbccd.edu), M.A.

- Heating, Ventilation, Air Conditioning and Refrigeration Associate of Science Degree
- Heating, Ventilation, Air Conditioning and Refrigeration Certificate of Achievement
- Refrigeration Service Engineer Society (HVAC) Certificate of Achievement

HVAC/R 001 4 Units
HVAC/R Fundamentals
Lecture: 54 contact hours
Lab: 54 contact hours
This course covers basic principles of refrigeration, refrigerants, refrigeration components and tools; repair and testing of refrigeration units; and basic brazing and soldering.
Associate Degree Applicable

HVAC/R 002 4 Units
Domestic Mechanical Refrigeration
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: HVAC/R 001
This course covers principles of refrigeration compression systems, operations and controls, refrigeration and freezer construction, piping and parts layout. Included in the lab work is troubleshooting and servicing domestic refrigeration units.
Associate Degree Applicable

HVAC/R 003 4 Units
Commercial Mechanical Refrigeration
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: HVAC/R 001
This course covers theory of compressor construction and operation, principles of all types of refrigerant controls and multi-stage control devices pertaining to commercial and industrial refrigeration including practical lab work.
Associate Degree Applicable

HVAC/R 004 4 Units
Electrical Fundamentals for HVAC/R
Lecture: 54 contact hours
Lab: 54 contact hours
This course covers fundamentals of direct and alternating current circuits, test equipment, most common electric motors, wiring and control devices used in modern refrigeration equipment including practical lab work with electrical refrigeration trainers and projects.
Associate Degree Applicable

HVAC/R 005 4 Units
Commercial Electric for HVAC/R
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: HVAC/R 001 and HVAC/R 004
This course covers solid state control systems with emphasis on schematic reading and electrical troubleshooting pertaining to refrigeration equipment including practical lab work with electrical refrigeration trainers and projects.
Associate Degree Applicable

HVAC/R 006 4 Units
HVAC/R Air Distribution Systems
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: HVAC/R 001
This course covers theory of multiple-stage systems and multiple-control devices with emphasis on condensing and evaporation equipment, heavy duty piping layout, forced-air heating, ventilation, and air conditioning including lab work with refrigeration trainers and projects.
Associate Degree Applicable

HVAC/R 007 3 Units
Welding for HVAC/R
Lecture: 18 contact hours
Lab: 108 contact hours
This course covers intensive training in soldering, brazing and welding techniques on copper tubing, steel and dissimilar metals using oxyacetylene and special gas torches as practiced in the refrigeration, HVAC industry including blueprint reading and fabrication.
Associate Degree Applicable

HVAC/R 050C 3 Units
Compressors, Condensers and Cooling Towers
Lecture: 54 contact hours
This course provides comprehensive instruction on three major components of refrigeration and air conditioning systems, compressors, condensers, and cooling towers. Students gain knowledge of reciprocating, rotary, screw, centrifugal, and scroll compressors, as well as classifications of compressors (open, semi-hermetic, and hermetic). Air condensers, water-cooled condensers, evaporative condensers and cooling towers, and water treatment are also covered.
Associate Degree Applicable

HVAC/R 051C 3 Units
Heating Fundamentals
Lecture: 54 contact hours
This is one of three courses of a three-semester national training course offered by the Refrigeration Service Engineers Society (RSES) and the North American Technician Excellence (NATE) and is a comprehensive study of compressors, condensers, and accessories. This course is designed to help certify journeymen-level refrigeration technicians and keep their knowledge current.
Associate Degree Applicable

HVAC/R 052C 3 Units
Heating Transfer & Distribution
Lecture: 54 contact hours
This course introduces the basic principles of heat transfer, radiation, conduction, and convection are explained in detail, along with estimating heat loads for residential structures and the principles of air distribution. Included are lessons related to fans and blowers and instruction on fan laws, fan classifications, centrifugal fans, and fan efficiency.
Associate Degree Applicable

HVAC/R 055C 3 Units
Gas Heating
Lecture: 54 contact hours
This course explores the concepts of heating with gas. Included in the course are lessons related to combustion chemistry, heating fuels, burners and accessories, burners and components (including natural gas-burning and LP gas-equipment), start-up and combustion efficiency testing, gas burner controls, ignition systems for infrared heaters, gas heating equipment maintenance, troubleshooting, and condensing furnaces.
Associate Degree Applicable

HVAC/R 056C 3 Units
Hot Water Heating
Lecture: 54 contact hours
This course offers instruction in the principles and theories of hot water heating. Students will learn about hot water boilers and controls, heat transfer units, centrifugal pumps, air controls, hot water specialties, piping methods, pressure drop calculations, zoning, primary/secondary pumping, radiant heating systems, temperature controls, troubleshooting system components, and analysis of system problems.
Associate Degree Applicable

HVAC/R 057C 3 Units
Tools, Controls, and Troubleshooting
Lecture: 54 contact hours
This course is one of a three-semester national training course offered by the Refrigeration Service Engineers Society (RSES) and the North American Technician Excellence (NATE). It is a comprehensive study of the tools of the trade and control diagnostics with testing instruments. This course is designed to help students seeking journeymen-level certification as refrigeration technicians and keep abreast of current technology.
Associate Degree Applicable

HVAC/R 060C 3 Units
Troubleshooting Refrigeration and A/C Electricity 4
Lecture: 54 contact hours
This is a one semester course that includes the first of a three-term course offered by the Refrigeration Service Engineers Society (RSES) and is a comprehensive study of troubleshooting HVAC/R electrical circuits. This course is designed to help certify journeymen-level refrigeration technicians and keep their knowledge current.
Associate Degree Applicable

HVAC/R 061C 3 Units
Troubleshooting Refrigeration and A/C Electricity 5
Lecture: 54 contact hours
This is a one semester course that includes the second of a three-term course offered by the Refrigeration Service Engineers Society (RSES) and is a comprehensive study of troubleshooting HVAC/R electrical circuits. This course is designed to help certify journeymen-level refrigeration technicians and keep their knowledge current.
Associate Degree Applicable

HVAC/R 062C 4 Units
RSES Electricity and Electricity Lab for HVAC/R Technicians
Lecture: 54 contact hours
Lab: 54 contact hours
Prerequisite: HVAC/R 060C and HVAC/R 061C
This is a one semester course offered by the Refrigeration Service Engineers Society that includes a hands on lab with emphasis on electrical safety, the fundamentals of electricity, series and parallel circuits, A/C current, magnetism and transformers, relays, contactors, starters, motors and capacitors, compressors, circuit protection devices, and thermostats. Also included are lessons on reading schematics and troubleshooting gas furnaces and split-systems. This course is designed to help certify journeymen-level refrigeration technicians and keep their knowledge current.
Associate Degree Applicable

HVAC/R 065C 3 Units
RSES Technical Institute Heat Pump Training Course Volume I
Lecture: 54 contact hours
This is a one-semester course that includes the first of two heat pump classes offered by the Refrigeration Service Engineers Society and is a comprehensive introduction to heat pump theory, fundamentals, and includes water-source heat pumps. Students will also study heat pump compressors, flow controls and accessories; heat pump electrical systems and components, thermostats; air-to-air heat pump defrost; supplemental electric heat; fossil fuel backup heat and heat pump piping. Additional subjects include heat pump performance criteria; checks; and procedures. This course is designed to help certify journeymen-level refrigeration technicians and keep their knowledge current.
Associate Degree Applicable

HVAC/R 066C 3 Units
RSES Technical Institute Heat Pump Training Course Volume II
Lecture: 54 contact hours
This is a one-semester course that includes the second of two heat pump classes offered by the Refrigeration Service Engineers Society, and is an advanced class for heat pump troubleshooting, and includes water-source heat pumps, and water source heat pumps for special applications. Students will study both standard and high-efficiency air-to-air heat pump electrical and refrigerant-side troubleshooting, (both heating, and cooling). Students will also do heat pump load calculations, indoor air distribution, duct design with emphasis on diagnosing airflow problems. Customer relations will also be addressed. This course is designed to help certify journeymen-level refrigeration technicians, and keep their knowledge current.
Associate Degree Applicable

HVAC/R 067C 3 Units
RSES Technical Institute Training Manual 3 Volume I
Lecture: 54 contact hours
This is the first term class of the two-term Training Manual 3 classes offered by the Refrigeration Service Engineers Society and is a comprehensive introduction to heat pump theory, including water-source heat pumps. Students will also study fans and blowers, economizers, computer room environmental controls, air filtration and distribution, cooling towers, and water treatment. Additional subjects include evaporative condensers, heat transfer coils, and closed-circuit water coolers. These courses are designed to help certify journeymen-level refrigeration technicians and keep their knowledge current.
Associate Degree Applicable

HVAC/R 068C 3 Units
RSES Technical Institute Training Manual 3 Volume II
Lecture: 54 contact hours
This is the second term class of the two-term Training Manual 3 classes offered by the Refrigeration Service Engineers Society and is a comprehensive introduction to heat pump theory, including water-source heat pumps. Students will also study fans and blowers, economizers, computer room environmental controls, air filtration and distribution, cooling towers, and water treatment. Additional subjects include, evaporative condensers, heat transfer coils, and closed-circuit water coolers. These courses are designed to help certify journeymen-level refrigeration technicians and keep their knowledge current.
Associate Degree Applicable

HVAC/R 098 1-4 Units
Refrigeration Work Experience
WRKEX: 300 contact hours
Supervised training, in the form of on the job employment that will enhance the student's knowledge in the selected field of study. The student's major and job must match. For paid work, 75 hours = 1 unit; for volunteer work, 60 hours = 1 unit. Students may earn a total of 16 units toward graduation in Work Experience 098 courses. See department for specific guidelines.
Associate Degree Applicable

HVAC/R 601 Noncredit
HVAC/R Fundamentals
Lecture: 54 contact hours
Lab: 54 contact hours
This noncredit course covers basic principles of refrigeration, refrigerants, refrigeration components and tools; repair and testing of refrigeration units; and basic brazing and soldering.