



Utah System of Higher Education
HVACR Technician
FY2025 / 15 Credits (450 Clock-Hours)

Foundational Courses

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| TEAC 1010 Introduction to Air Conditioning, Heating and Refrigeration | 3 Credits / 90 Clock-Hours |
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An introductory course explaining the principles of Heating, Air Conditioning, and Refrigeration (HVACR). The basic refrigeration cycle and components will be covered. Elementary electrical concepts, electrical heating systems, and hydronic heating systems will be introduced. Guiding principles for service and installing technicians, i.e., hand-tools, safety, energy conservation, certifications, codes, and permits will be introduced. Careers in HVACR will be explored and trade math skills reviewed.

Objectives:

- Explain the basic principles of air conditioning, heating, refrigeration, and ventilation.
- Explain the basic refrigeration cycle and its four major components.
- Describe the fundamental principles of electricity and basic circuits.
- Identify common hand tools, their use, and care.
- Identify career paths in the air conditioning, heating, and refrigeration trade.

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| TEAC 1100 HVACR Electrical Essentials | 3 Credits / 90 Clock-Hours |
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The skills reviewed in Introduction to Air Conditioning, Heating, and Refrigeration will be applied to electrical circuits as basic electrical theory is broadened with activities using various electrical meters to reinforce learning from classroom instruction. Electrical components in HVACR systems will be presented as students learn to interpret and produce various electrical diagrams illustrating how these systems are controlled.

Objectives:

- Describe the fundamentals of electricity and electrical theory.
- Identify electrical measuring instruments and demonstrate their proper use.
- Identify electrical components utilized in ACHR systems and describe their functions.
- Identify, interpret, and create various types of electrical diagrams associated with HVACR systems.

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| TEAC 1120 Heating Systems | 3 Credits / 90 Clock-Hours |
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An introduction to heating fundamentals including heat transfer and combustion theory. Furnace types, their specific control components and sequences of operation will be covered. Students will also prepare for the Rocky Mountain Gas Association (RMGA) Gas Technician Certification exam.

Objectives:

- Explain the fundamentals of heating, heat transfer, and combustion.
- Explain the sequence of operation for residential forced-air furnaces.
- Troubleshoot a variety of electrical and mechanical furnace problems.
- Demonstrate mastery of RMGA Certification knowledge by passing the RMGA exam or its equivalent.



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TEAC 1140 Basic Refrigeration Systems

3 Credits / 90 Clock-Hours

An introductory course covering the physical and chemical laws governing the principles of refrigeration. A more in-depth study of the refrigeration cycle, system components, refrigerants, and refrigerant controls will be covered.

Objectives:

- Describe the fundamental refrigeration cycle including heat, states of substances, heat transfer, and pressure/temperature relationships.
- Identify common refrigerants and understand their differences and develop an understanding of proper refrigerant handling techniques and the application of EPA Section 608 rules.
- Identify and describe the function of the major refrigerant system components including compressor types and operational characteristics.
- Identify and describe the function of common refrigeration accessories and controls.
- Demonstrate the proper use of refrigerant manifold gauges to evaluate, service, and diagnose refrigerant systems including refrigerant recovery, system evacuation, and refrigerant charging procedures.

TEAC 1160 Basic Installation Skills

3 Credits / 90 Clock-Hours

Copper tubing and pipe joinery will be covered, including tools and equipment, and their proper use will be demonstrated while emphasizing safety. Oxy-acetylene, air-acetylene and MAPP equipment will be covered. Installation related devices, wiring, tubing installation and sheet metal methods will also be covered. Various hanging and support methods will also be addressed.

Objectives:

- Identify and demonstrate several types of piping, fittings, and joining methods.
- Demonstrate how to safely start-up, operate and shut-down an oxy-acetylene torch set.
- Demonstrate electrical installation skills for both line voltage wiring and low voltage control systems.
- Describe lineset sizing and installation means and methods.
- Design and fabricate a basic sheet metal fitting/transition.

Supplemental Courses Varies by Institution

Davis

TEAC 1200 Dual Fuel Heat Pumps

1 Credit / 30 Clock-Hours

This course will examine the operation of Heat Pumps in both cooling, heating and defrost modes. Balance points, control methods and associated wiring requirements will be reviewed. Troubleshooting will also be covered.

Objectives:

- Explain the application of several types of heat pump systems including air to air, dual fuel, and ground source.
- Describe the operation of a heat pump in heating, cooling, and defrost modes.
- Determine both thermal and economic balance points for a heat pump system on a home.
- Demonstrate the correct wiring for several types of heat pump systems.



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TEAC 1210 Indoor Air Quality

1 Credit / 30 Clock-Hours

Students will become familiar with the various aspects of indoor air quality including methods of air filtration, humidification, the psychrometric chart, and fresh air supply systems. Various fresh air ventilation methods and periodic maintenance will also be covered.

Objectives:

- Identify the MERV ratings and applications of several types of impingement filters and electronic air cleaners.
- Describe the benefits of humidification, the operation of the three different types of humidifiers, along with their various advantages and disadvantages.
- Demonstrate using a psychrometer and a psychrometric chart to determine the change in relative humidity, dew point, volume, moisture content and enthalpy in a system, both in heating and cooling.
- Explain the fresh air requirements for occupied spaces and the methods used to provide fresh air, including dampers, HRV and ERV equipment.

TEAC 1220 ACHR Advanced Troubleshooting - Electrical

1 Credit / 30 Clock-Hours

Students will delve deeper into electrical diagnosis using schematics, both pictorial and ladder, various test instruments, including multimeters and clamp-on ammeters, to troubleshoot electrical problems on Air Conditioning and Heating systems. Sequence of operation troubleshooting for systems with electronic control boards will also be covered.

Objectives:

- Create a pictorial diagram based on a unit's existing wiring and convert it to a ladder diagram.
- Use a ladder diagram to determine a system's sequence of operation.
- Troubleshoot a system that has an electronic control board.
- Identify failed components using a multimeter.

TEAC 1230 ACHR Advanced Troubleshooting - Refrigeration

1 Credit / 30 Clock-Hours

The refrigeration cycle can sometimes be difficult to troubleshoot because it is a dynamic system with each part affecting the operation of every other part. This course will teach a linear approach to refrigeration system evaluation that will identify what's working correctly and what's not.

Objectives:

- Determine high and low side saturation temperatures, superheat and subcooling.
- Identify possible causes of saturation temperatures, superheat or subcooling that are too high or too low.
- Evaluate a system and determine if it's operating properly. If not operating properly, determine what corrective actions need to be performed.

TEAC 1240 Sheet Metal Fabrication

1 Credit / 30 Clock-Hours

This class will build upon the basic sheet metal skills learned in the core by using equipment in the lab to fabricate several projects.

Objectives:

- Demonstrate the appropriate use of hand tools to cut square, rectangle and circular holes in ductwork.
- Fabricate a tool tray with Pittsburgh seams using equipment such as a stomp shear, Pittsburgh machine, brake and bar fold.
- Layout and build several duct fittings.



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TEAC 1250 EPA 608 Refrigerant Handling Certification

1 Credit / 30 Clock-Hours

This course will cover the fundamental science associated with, and the basic operational components of the refrigeration cycle. This will be followed by a practice of service procedures associated with sealed system service, such as Refrigerant Recovery, Evacuation and Charging a system. The latter half of the course will be preparation to pass the EPA 608 Refrigerant Handling Certification Exam, after which the exam will be given as part of the course.

Objectives:

- Explain the terminology and physics associated with heat transfer and the refrigeration cycle.
- Diagram the 5 components necessary for the gas compression refrigeration cycle to operate.
- Demonstrate the use of a manifold gauge set, a refrigerant recovery machine, vacuum pump and micron gauge.
- Describe the concerns with refrigerants, ozone depletion, global warming and refrigeration service procedures.
- Achieve EPA 608 Refrigerant Handling Certification Types 1 and 2.

TEAC 1260 Working with Tubing: Flaring, Soldering, and Brazing

1 Credit / 30 Clock-Hours

Since many refrigeration systems use copper tubing, it's important to be able to connect tubing to refrigeration and air conditioning systems so there are no possibilities of leaks. This course will practice tube cutting, flaring, swaging, as well as using soft solder and silver-based brazing methods using propane, MAPP, and acetylene fueled torches.

Objectives:

- Identify types of tubing, and demonstrate tube cutting, flaring and swaging methods.
- Join tubing using soft solder using propane and MAPP gas torches and pressure test to verify no leaks.
- Join tubing using silver-based brazing with MAPP gas, air-acetylene and oxy-acetylene torches, then leak test.
- Demonstrate flowing nitrogen while brazing to prevent internal oxidation of copper tubing.

TEAC 1270 Residential Load Calculation and Duct Design

2 Credits / 60 Clock-Hours

This course addresses the two most critical aspects when installing or replacing Air Conditioning and Heating systems, proper equipment sizing and ductwork. The course will use Manual J for load calculations and Manual D for duct design. The Quality Installation Standard (Standard 5) from the Air Conditioning Contractors of America (ACCA) will also be reviewed.

Objectives:

- Use Manual J procedures to determine the correct equipment size for an air conditioning and heating system.
- Use Manual D procedures to design the ductwork for a home's air conditioning and heating system.
- Select equipment based on the Manual J and D requirements.
- Describe the installation expectations of ACCA Standard 5



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TEAC 1280 RMGA Gas Technician Certification

2 Credits / 60 Clock-Hours

A technician in Utah who works on gas fired appliances, such as stoves, furnaces, boilers and water heaters, is requirement to have passed the Gas Technician Certification exam from the Rocky Mountain Gas Association. This course is preparation to pass the exam with a score of at least 80%. This course will have minimal hands-on lab work.

Objectives:

- Describe the combustion process and its potential hazards.
- Properly size a gas piping system.
- Calculate the correct size for a combustion air supply.
- Determine a gas fired appliance's deration requirements.
- Size vent systems for Category 1 and Category 4 appliances.

Dixie

TEAC 1300 HVACR Residential and Commercial Air Conditioning Systems

2 Credits / 60 Clock-Hours

This course is designed to give an in-depth study for the student to understand the operations of air conditioning systems. The course will cover air conditioning operations, diagnostics, troubleshooting, and repair of the systems and components.

Objectives:

- Explain the fundamentals of air conditioning systems.
- Explain the sequence of operation for residential and commercial air conditioning.
- Troubleshoot a variety of electrical and mechanical air conditioning problems.
- Demonstrate proper charging practices using superheat and subcool.

TEAC 1310 HVACR Exit skills

1 Credit / 30 Clock-Hours

Students will be required to demonstrate basic entry level skills required to be a successful HVACR technician.

Objectives:

- Student will demonstrate basic skills through real life scenarios before being awarded certification.

Mountainland

TEAC 1400 Introduction to HVACR Careers

3 Credits / 90 Clock-Hours

The Introduction to HVACR Careers and RMGA Certification course will prepare students for the Rocky Mountain Gas Association Gas technician certification. Students will learn HVACR mathematics for technicians and be introduced to the HVACR career field identifying multiple career field paths, with an emphasis on future industry changes. Trac Pipe Gas Certification training provided by AIMR.

Objectives:

- Describe an overview of the HVACR industry.
- Describe the different career paths offered in HVACR. Including and not limited to Residential, Commercial, Sales & marketing, Automated Controls, HVAC Technology, Building Operations, Energy Management, Building Commissioning, Renewable Energy, Energy Auditing & Analysis and Design & Engineering.
- Perform mathematical calculations for technicians.
- Pass the RMGA exam.
- Obtain the Trac Pipe Gas Certification by Association of Industry Manufacturers Representatives (AIMR).



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TEAC 1420 Advanced Controls and Exit Skills

3 Credits / 90 Clock-Hours

The Advanced Controls and Exit Skills course is an introduction to advanced electrical principles and theory with regards to residential and commercial HVACR controls, with an emphasis on the following: direct digital controls, electrical wiring, proper grounding of equipment, common problems such as fraying, corrosion, disconnection, and troubleshooting using the hopscotch method.

Objectives:

- Diagnose and troubleshoot electrical control systems commonly used in HVACR systems considering the operation and interconnections of controller digital and analog inputs, and digital and analog outputs, to include relays, contactors, switches, transformers, and control boards.
- Read and interpret electrical schematics and blueprints to effectively install, repair, and modify wiring systems in HVACR applications including wire sizing, color coding, grounding, and safety protocols.
- Explain the components and operation of HVACR systems, including air conditioning, heating, ventilation, and refrigeration. Discuss the interplay between mechanical and electrical components as a whole system.
- Diagnose and rectify mechanical issues commonly encountered in HVACR systems. Demonstrate techniques for troubleshooting problems related to compressors, fans, motors, coils, valves, and refrigerant circuits.
- Engage in and demonstrate practical exercises and hands-on labs to reinforce troubleshooting skills and enhance familiarity with mechanical and electrical controls, wiring techniques, and HVACR systems.
- Demonstrate customer relation techniques and crew leadership best practices.
- Complete the NATE CHP-5 Service Certification.

Salt Lake

TEAC 1500 DO NOT USE

3 Credits / 90 Clock-Hours

DO NOT USE

TEAC 1510 Air Distribution Systems

3 Credits / 90 Clock-Hours

Students will be introduced to air movement theory and laws, air measurement, air distribution systems, air distribution equipment, and air system design. The different types of fans and blowers will be studied along with their various applications and energy characteristics.

Objectives:

- Explain how pressure, velocity, and volume are related to airflow.
- Describe the equipment and materials used in air distribution systems.
- Identify various air distribution systems and their energy characteristics.
- Demonstrate the planning and installation of modern duct systems.



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Snow

TEAC 2200 Refrigeration Systems

3 Credits / 90 Clock-Hours

This course is designed to enhance the qualifications of the technician to understand the different temperature classifications, equipment and operational conditions within the classifications. This includes special refrigeration system components, such as two temperature system components, evaporator pressure controls, crankcase pressure regulators, low ambient controls, pressure controls and safety devices, defrost methods, and accessories. Refrigeration system applications are covered, which includes merchandising options for refrigeration systems, automatic pump down cycle, multiple evaporator systems, multiple compressor systems (rack systems), secondary refrigerant systems, pressurized liquid systems, staggered defrost methods, vending machine refrigeration, water coolers, mobile (transport) refrigeration systems, cascade refrigeration systems, and ice making. Special refrigeration applications are covered as well as the preparation of achieving the Environmental Protection Agency's 608 Refrigerate Handlers Certificate which is required by federal law.

Objectives:

- Explain multiple refrigeration system types and their major components.
- Explain valves, their function and placement in refrigeration systems.
- Explain compressor types and their characteristics.
- Explain and/or demonstrate troubleshooting components of a refrigeration system.

TEAC 2300 System Installation, Air Distribution, and Balance

3 Credits / 90 Clock-Hours

This course is designed to enhance the qualifications of the technician with the in-depth study of system installation and start up. Covering proper system locations, piping, electrical connections, condensate removal, system leak and charge check. The air distribution system will be covered including configurations, selection, duct materials, installation, airflow calculations, sizing of air distribution systems, register and grill selection, and balancing of the system. Measuring airflow equipment used for system pressure balancing in the distribution system while adjusting air volumes, dampers and registers are addressed. With high cost of energy, monetarily as well as environmentally, Residential Energy Auditing and diagnostic testing of the system through numerical analysis and reporting is becoming crucial. Heat gain and heat loss calculations to ensure efficient and safe system round out this vital course.

Objectives:

- Recognize and explain air distribution systems and their configurations.
- Explain and/or demonstrate applications, installations and joining of duct materials
- Explain and/or demonstrate sizing and balancing of the air distribution system.
- Explain and/or demonstrate residential energy auditing and its importance.



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TEAC 2400 System Diagnostics, Troubleshooting, and Servicing

3 Credits / 90 Clock-Hours

This course is designed to enhance the qualifications of the technician with the in-depth study of system diagnosis in high, medium and low temperature classes. Exploring causes and remedies from superheat and/or sub cooling out of parameters to evaluating the efficient operating conditions of compressors, condensers, evaporators and metering devices. Troubleshooting is a vital part of maintaining an efficient and safe operating system while performing a successful service call. Critical thinking will be addressed including verifying the problem, gathering information, performing visual inspections, isolating and identifying system problems ultimately correcting the problem, testing and completion of the service call. Residential Energy Auditing including diagnostic testing, duct and air leakage testing, combustion and furnace efficiency, HVAC/R venting, and draft testing, numerical analysis and reporting will be covered.

Objectives:

- Explain and/or demonstrate the purpose of controls, types, and control mechanisms.
- Explain industrial, commercial, automotive, and appliance refrigeration components for servicing.
- Explain electrical theory and safety related issues.
- Explain and recognize special refrigeration systems and their components.

TEAC 2500 Sheetmetal

3 Credits / 90 Clock-Hours

This course is designed to enhance the qualifications of the technician to understand the physical creation of different air distribution systems. By understanding field measurements, calculations, fittings, construction and sheet metal drawings. This will be an introduction to radial line development, triangulation, duct fabrication standards, bend allowances and soldering as it pertains to the Air Conditioning, Heating and Refrigeration industry.

Objectives:

- Explain and/or demonstrate solving basic equations related to linear measurements, angles, triangles, circles, and arcs and make field measurements and calculate offsets.
- Explain and/or demonstrate various construction plans, identify and describe codes and standards organizations and SMACNA standard for sheet metal.
- Explain and/or demonstrate radial line development to lay out tapered components, describe the triangulation method and how it is used and identify bending factors.
- Explain and/or demonstrate tools and their use and materials used to solder sheet metal.

USU - Eastern

TEAC 1500 DO NOT USE

3 Credits / 90 Clock-Hours

DO NOT USE



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TEAC 1510 Air Distribution Systems

3 Credits / 90 Clock-Hours

Students will be introduced to air movement theory and laws, air measurement, air distribution systems, air distribution equipment, and air system design. The different types of fans and blowers will be studied along with their various applications and energy characteristics.

Objectives:

- Explain how pressure, velocity, and volume are related to airflow.
- Describe the equipment and materials used in air distribution systems.
- Identify various air distribution systems and their energy characteristics.
- Demonstrate the planning and installation of modern duct systems.