

# AIR CONDITIONING AND REFRIGERATION

The Air Conditioning and Refrigeration (HVAC/R) Program provides occupational training to prepare students for jobs in the HVAC/R industry, including the green economy sector (energy auditing). The program also provides valuable skill enhancement training to existing HVAC/R technicians who desire to expand and update their knowledge and skills to advance in the industry. Students in the program learn the theoretical, technical, and problem-solving skills essential for employment and advancement in the HVAC/R industry.

Students completing the program can seek employment as HVAC/R technicians, sales and consulting specialists, equipment and system installers, operations and maintenance technicians, building engineers, controls technicians, and energy auditing specialists. As a CTE program with an industry advisory council that meets annually and communicates regularly, we have developed an educational partnership with the area HVAC/R industry and we are meeting a defined need to provide qualified HVAC/R technicians and energy auditors to HVAC/R businesses that service corporations and homes in Ventura County and beyond.

## **AC R010 Introduction to Air Conditioning and Refrigeration 3 Units**

*Formerly:* ENVT R010

*In-Class Hours:* 52.5 lecture

This course develops competency in the theoretical troubleshooting of mechanical problems in air conditioning and refrigeration systems through an understanding of the operating principles for refrigeration. It is recommended as a first semester course for persons who want to develop or improve job skills in the air conditioning, heating and refrigeration industry. Together with the lab course (AC R010L), this course targets the service technician who wishes to develop troubleshooting and repair skills. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.

**Field Trips:** May be required

**Degree Applicability:** Applies to Associate Degree

**AA/AS GE:** None

**Transfer Credit:** None

## **AC R010L Introduction to Air Conditioning and Refrigeration I Lab 2 Units**

*Formerly:* ENVT R010L

*In-Class Hours:* 17.5 lecture, 52.5 laboratory

This course develops competency in the hands-on troubleshooting of mechanical problems in air conditioning and refrigeration systems through an understanding of the operating principles for refrigeration. It is recommended as a first semester course for persons who want to develop or improve job skills in the air conditioning, heating and refrigeration industry. Together with the lecture course (AC R010), this class targets the service technician who wishes to develop refrigeration troubleshooting and repair skills. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.

**Field Trips:** May be required

**Degree Applicability:** Applies to Associate Degree

**AA/AS GE:** None

**Transfer Credit:** None

## **AC R011L Air Conditioning and Refrigeration II Lab 2 Units**

*Formerly:* ENVT R011L

*In-Class Hours:* 17.5 lecture, 52.5 laboratory

*Prerequisites:* AC R010L

This course develops additional competency in the hands-on troubleshooting of mechanical problems in air conditioning and refrigeration systems through an understanding of the operating principles for refrigeration. It is recommended as a second semester course for persons who want to develop or improve job skills in the air conditioning, heating and refrigeration industry. Together with the first semester lab course (AC R010L), this class targets the service technician who wishes to develop refrigeration troubleshooting and repair skills. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.

**Field Trips:** May be required

**Degree Applicability:** Applies to Associate Degree

**AA/AS GE:** None

**Transfer Credit:** None

## **AC R020 Electrical Systems I 3 Units**

*Formerly:* ENVT R020

*In-Class Hours:* 52.5 lecture

This course develops competency in the theoretical troubleshooting of mechanical problems in air conditioning and refrigeration systems through an understanding of the operating principles for electrical wiring systems used in air conditioning and refrigeration installations. It is recommended for persons who want to develop or improve job skills in the air conditioning, heating and refrigeration industry. Together with the lab course (AC R020L), this course targets the service technician who wishes to develop skills in reading wiring diagrams, identifying electrical components, and electrical troubleshooting and repair skills. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.

**Field Trips:** May be required

**Degree Applicability:** Applies to Associate Degree

**AA/AS GE:** None

**Transfer Credit:** None

## **AC R020L Electrical Systems I Lab 2 Units**

*Formerly:* ENVT R020L

*In-Class Hours:* 17.5 lecture, 52.5 laboratory

This course develops competency in the theoretical troubleshooting of mechanical problems in air conditioning and refrigeration systems through an understanding of the operating principles for electrical wiring systems used in air conditioning and refrigeration installations. It is recommended for persons who want to develop or improve job skills in the air conditioning, heating and refrigeration industry. Together with the lab course (AC R020), this course targets the service technician who wishes to develop skills in reading wiring diagrams, identifying electrical components, and electrical troubleshooting and repair skills. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.

**Field Trips:** May be required

**Degree Applicability:** Applies to Associate Degree

**AA/AS GE:** None

**Transfer Credit:** None

**AC R021L Electrical Systems II Lab 2 Units***Formerly:* ENVT R021L*In-Class Hours:* 17.5 lecture, 52.5 laboratory*Prerequisites:* AC R020L

This course develops additional competency in the hands-on troubleshooting of mechanical problems in air conditioning and refrigeration systems through an understanding of the operating principles for electrical wiring systems used in air conditioning and refrigeration installations. It is recommended for persons who want to continue their development of electrical troubleshooting job skills in the air conditioning, heating and refrigeration industry through practice on live equipment. Together with the introductory electrical lab course (AC R020L), this course targets the service technician who wishes to develop a higher skill level in reading wiring diagrams, identifying electrical components, and electrical troubleshooting and repair skills. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.**Field Trips:** May be required**Degree Applicability:** Applies to Associate Degree**AA/AS GE:** None**Transfer Credit:** None**AC R030 Airside Systems 3 Units***Formerly:* ENVT R030*In-Class Hours:* 52.5 lecture

This course develops competency in the theoretical troubleshooting of air side problems in air conditioning/heating systems through an understanding of the principles of air flow, the properties of air, theory of controls, reading of construction drawings, and calculation of building loads. It is recommended for persons who want to develop or improve job skills in the air conditioning, heating and refrigeration industry. Together with the lab course (AC R030L), this course targets the service technician who wishes to develop skills in designing and troubleshooting building air conditioning systems and controls. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.**Field Trips:** May be required**Degree Applicability:** Applies to Associate Degree**AA/AS GE:** None**Transfer Credit:** None**AC R030L Airside Systems Lab 2 Units***Formerly:* ENVT R030L*In-Class Hours:* 17.5 lecture, 52.5 laboratory

This course develops competency in the hands-on troubleshooting of air side problems in air conditioning/heating systems through an understanding of the principles of air flow, the properties of air, theory of controls, reading of construction drawings, and calculation of building loads. It is recommended for persons who want to develop or improve job skills in the air side segment of the air conditioning, heating and refrigeration industry through practice with live equipment and tools. Together with the lecture course (AC R030), this course targets the service technician who wishes to develop skills in designing and troubleshooting building air conditioning systems and controls. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.**Field Trips:** May be required**Degree Applicability:** Applies to Associate Degree**AA/AS GE:** None**Transfer Credit:** None**AC R040 Heating and Control Systems 3 Units***Formerly:* ENVT R040*In-Class Hours:* 52.5 lecture

This course develops competency in the theoretical troubleshooting of mechanical and electrical problems in heating systems through an understanding of the operating principles for heating and furnace electrical control circuits. It is recommended for persons who want to develop or improve job skills in the heating segment of the air conditioning, heating and refrigeration industry. Together with the lab course (AC R040L), this course targets the service technician who wishes to develop skills in designing and troubleshooting heating systems and controls. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.**Field Trips:** May be required**Degree Applicability:** Applies to Associate Degree**AA/AS GE:** None**Transfer Credit:** None**AC R040L Heating and Control Systems Lab 2 Units***Formerly:* ENVT R040L*In-Class Hours:* 17.5 lecture, 52.5 laboratory

This course develops competency in the hands-on troubleshooting of mechanical and electrical problems in heating systems through an understanding of the operating principles of heating and furnace electrical control circuits. It is recommended for persons who want to develop or improve job skills in the heating segment of the air conditioning, heating and refrigeration industry. Together with the lecture course (AC R040), this course targets the service technician who wishes to develop skills in designing and troubleshooting heating systems and controls. It is also applicable for students wishing to enter the industry in the capacity of installer, sales representative, maintenance technician, or designer.

**Grade Modes:** Letter Graded, Credit by exam, license etc.**Field Trips:** May be required**Degree Applicability:** Applies to Associate Degree**AA/AS GE:** None**Transfer Credit:** None

**AC R050 Energy Auditing 3 Units**

*Formerly:* ENVT R050

*In-Class Hours:* 52.5 lecture

Energy auditing is part of the growing industry of green and sustainable technologies; an energy auditor helps to optimize the energy efficiency of a home or building while reducing the client's energy costs. An energy audit can also have a positive impact on the environment by reducing unnecessary energy consumption. This course is designed for the student who has a solid foundation in HVAC/R to learn how to perform detailed home and building inspections and make cost effective recommendations about improving energy efficiency. There is now an expectation in the industry that a technician's knowledge expand beyond just working on a system into understanding how the HVAC system fits into the whole house/building design. Many of the procedures and tests that are performed in an energy audit revolve around the heating and cooling systems and therefore a student interested in taking this course should have foundation level HVAC/R knowledge.

**Grade Modes:** Letter Graded

**Field Trips:** May be required

**Degree Applicability:** Applies to Associate Degree

**AA/AS GE:** None

**Transfer Credit:** None

**AC R050L Energy Auditing Lab 2 Units**

*Formerly:* ENVT R050L

*In-Class Hours:* 17.5 lecture, 52.5 laboratory

Energy auditing is part of the growing industry of green and sustainable technologies; an energy auditor helps to optimize the energy efficiency of a home or building while reducing the client's energy costs. An energy audit can also have a positive impact on the environment by reducing unnecessary energy consumption. This lab course accompanies the energy auditing lecture course and provides hands-on instruction on the proper safety practices and energy auditing tools necessary to perform an energy audit. Students will also learn how to use energy auditing software to gather and analyze energy auditing data. Many of the procedures and tests that are performed in an energy audit revolve around the heating and cooling systems, and therefore a student interested in taking this course should have foundation level HVAC/R knowledge.

**Grade Modes:** Letter Graded

**Field Trips:** May be required

**Degree Applicability:** Applies to Associate Degree

**AA/AS GE:** None

**Transfer Credit:** None

- Heating and Hydronics, Proficiency Award (<http://catalog.vcccd.edu/oxnard/programs-courses/air-conditioning-refrigeration/heating-hydronics-pa/>)
- Mechanical Systems for HVAC/R, Proficiency Award (<http://catalog.vcccd.edu/oxnard/programs-courses/air-conditioning-refrigeration/mechanical-systems-hvacr-pa/>)

*For more information contact:*

**Career Education Division Office (805) 678-5824**

- Air Conditioning and Refrigeration, Associate in Science (<http://catalog.vcccd.edu/oxnard/programs-courses/air-conditioning-refrigeration/air-conditioning-refrigeration-as/>)
- Air Conditioning and Refrigeration, Certificate of Achievement (<http://catalog.vcccd.edu/oxnard/programs-courses/air-conditioning-refrigeration/air-conditioning-refrigeration-coa/>)
- Airside Systems, Proficiency Award (<http://catalog.vcccd.edu/oxnard/programs-courses/air-conditioning-refrigeration/airside-systems-pa/>)
- Electrical Systems for HVAC/R, Proficiency Award (<http://catalog.vcccd.edu/oxnard/programs-courses/air-conditioning-refrigeration/electrical-systems-hvacr-pa/>)
- Energy Auditing, Proficiency Award (<http://catalog.vcccd.edu/oxnard/programs-courses/air-conditioning-refrigeration/energy-auditing-pa/>)