

COLLEGE OF THE DESERT

Course Code ACR-064

Course Outline of Record

1. Course Code: ACR-064
2.
 - a. Long Course Title: Air Conditioning & Refrigeration Electricity I
 - b. Short Course Title: AIR COND/REF/ELEC I
3.
 - a. Catalog Course Description:

This course introduces basic theory of electricity and electronics, skills needed to install and service electrical circuits of air conditioning and refrigeration systems. Also, components and symbols, wiring diagrams and wiring diagram exercises are included.
 - b. Class Schedule Course Description:

This course introduces basic theory of electricity and electronics.
 - c. Semester Cycle (if applicable): N/A
 - d. Name of Approved Program(s):
 - AIR CONDITIONING AND REFRIGERATION Certificate of Achievement
4. Total Units: 3.00 Total Semester Hrs: 90.00
Lecture Units: 2 Semester Lecture Hrs: 36.00
Lab Units: 1 Semester Lab Hrs: 54.00
Class Size Maximum: 27 Allow Audit: No
Repeatability No Repeats Allowed
Justification 0
5. Prerequisite or Corequisite Courses or Advisories:

Course with requisite(s) and/or advisory is required to complete Content Review Matrix (CCForm I-A)

Advisory: ENG 070

Advisory: ESYS 004
6. Textbooks, Required Reading or Software: (List in APA or MLA format.)
 - a. John Tomczyk; Eugene Silberstein, B.A., M.S., BEAP, CMHE; Bill Whitman; Bill Johnson (2017). Refrigeration Air Conditioning Technology (8th/e). Boston, MA 02210 Cengage Learning. ISBN: 9781305578296
College Level: Yes
Flesch-Kincaid reading level: 11.1
7. Entrance Skills: *Before entering the course students must be able:*
 - a. Understand the four basic operations of addition, subtraction, multiplication, and division on the whole numbers, integers, and rational numbers.
 - ESYS 004 - Compute using the four basic operations of addition, subtraction, multiplication, and division on the rational numbers.
 - b. Understand the use of whole number exponents and compute with them.
 - ESYS 004 - Apply the order of operations to simplify expressions involving several operations.
 - ESYS 004 - Comprehend the concept of a fraction as a part of a whole.
 - c. Apply the order of operations to simplify expressions involving several operations.
 - ESYS 004 - Apply the order of operations to simplify expressions involving several operations.
 - d. Understand the use of rounding and estimation and use these skills to solve problems.
 - ESYS 004 - Use rounding and estimation skills to solve problems.
 - e. Understand the concept of a fraction as a part of a whole.
 - ESYS 004 - Comprehend the concept of a fraction as a part of a whole.
 - f. Understand the concept of a ratio and use ratios to solve proportion problems.
 - ESYS 004 - Use the concept of ratio to determine the solution to a proportion problem.

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g. Understand percent and convert between percents, decimals, and fractions.

- ESYS 004 - Apply methods of conversion between percentages, decimals, and fractions.

h. Recognize and convert between units of measurements in both the American and metric systems, especially units of length, volume and weight.

- ESYS 004 - Convert units within the US and metric systems and between the US and metric system units using unit fractions.

i.

Describe work completed on an invoice.

- ENG 070 - Demonstrate annotation skills for improving understanding.
- ENG 070 - Construct sentences that demonstrate variety and effective word choice, using mostly college level diction.

j.

Demonstrate the ability to participate in class discussions and assigned projects.

- ENG 070 - Improve editing and revision strategies both individually and in peer review.

k.

Compose simple, organized responses to readings.

- ENG 070 - Comprehend and summarize readings.
- ENG 070 - Read and identify main ideas and supporting details.

l.

Introduce basic business writing.

8. Course Content and Scope:

Lecture:

1. Definition of electricity, electrical units and atomic electrical force
2. Introduction to Electricity
3. Symbols
4. Magnetism and Components
5. Circuits
 1. Circuit Diagrams
 2. Cooling circuit Diagram
 3. Heating Circuit Diagram
6. Electrical Safety
7. Use of Electrical Test Instruments
8. Glossary of electrical Terms

Lab: *(if the "Lab Hours" is greater than zero this is required)*

1. Read electrical diagrams
2. Use electrical test equipment
3. Troubleshoot electrical circuit
4. Simulation software
5. NATE preparation for core or specialty certificate

9. Course Student Learning Outcomes:

1. Apply skills and knowledge to determine safe and efficient operation of electrical circuits found in the residential HVACR industry.
2. Determine the presence of defects in the residential HVACR electrical system and suggest or perform corrections of any defects.
3. Read and understand ladder diagrams and schematic diagrams. Troubleshoot electrical circuits using electrical Diagrams.

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4.

Properly use all functions on multimeters and amp meters.

10. Course Objectives: *Upon completion of this course, students will be able to:*

- a. Read electrical diagrams.
- b. Use electrical test equipment.
- c. Troubleshoot electrical circuit.
- d. Demonstrate an understanding of basic theory behind electrical and electronic components.
- e. Demonstrate an understanding of how components work together to control A/C equipment.

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*

- a. Collaborative/Team
- b. Demonstration, Repetition/Practice
- c. Discussion
- d. Laboratory
- e. Lecture
- f. Observation
- g. Participation
- h. Technology-based instruction

Other Methods:

Videos/slides/CD presentation Simulation Software

12. Assignments: *(List samples of specific activities/assignments students are expected to complete both in and outside of class.)*

In Class Hours: 90.00

Outside Class Hours: 72.00

a. In-class Assignments

1. Make-up an electrical board circuit.
2. Handwritten wiring diagrams and ladder diagrams
3. online computer aided wiring diagrams
4. Students skills inventory to promote critical thinking
5. Complete laboratory assignments
6. Delmar Online Training Simulation
7. Mind Tap interactive

b. Out-of-class Assignments

1. Handwritten wiring diagrams and ladder diagrams
2. Attendance at trade shows
3. Reading assignments
4. Complete Review Questions at end of Units
5. Delmar Online Training Simulation
6. Mind Tap interactive

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*

- Written homework
Unit Review Questions Wiring Diagrams
- Laboratory projects
Create and Evaluate Electrical Circuits from Wiring Diagrams
- Group activity participation/observation
Lab Teams working on group projects
- Product/project development evaluation
Evaluate electrical boards created in lab and observe Student understanding.

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- True/false/multiple choice examinations
RACT Test Bank, Skill Check Questions.
- Mid-term and final evaluations
2 part final Part 1 Lab: Hands-on Exam demonstrating ability to apply basic trade Skills. Part 2 Cumulative Written exam on RACT Units & Skill Checks.
- Behavior assessment
Soft Skill observation, Punctuality, attendance, Lab Participation, professionalism in the workplace -(Lab environment)

14. Methods of Evaluating: Additional Assessment Information:

15. Need/Purpose/Rationale -- *All courses must meet one or more CCC missions.*

PO - Career and Technical Education

Fulfill the requirements for an entry- level position in their field.

Apply critical thinking skills to execute daily duties in their area of employment.

Apply critical thinking skills to research, evaluate, analyze, and synthesize information.

Display the skills and aptitude necessary to pass certification exams in their field.

Exhibit effective written, oral communication and interpersonal skills.

IO - Critical Thinking and Communication

Apply principles of logic to problem solve and reason with a fair and open mind.

Summarize, analyze, and interpret oral and written texts, with the ability to identify assumptions and differentiate fact from opinion.

16. Comparable Transfer Course

University System	Campus	Course Number	Course Title	Catalog Year
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17. Special Materials and/or Equipment Required of Students:

1. Loose leaf notebook
2. Pocket calculator
3. Temperature/Pressure Chart
4. Superheat/Subcooling Calculator, Carrier GT24-01
5. Safety Glasses
6. Ear Plugs
7. Work Gloves

18. Materials Fees: ☐ Required Material?

Material or Item	Cost Per Unit	Total Cost
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19. Provide Reasons for the Substantial Modifications or New Course:

At our advisory meetings there has been overwhelming support to change the delivery pattern of our courses to support student success by enabling students to take introductory courses at the beginning of each semester. The cohort structure has two 8 Week back to back schedules with the pairing of introductory and advanced level courses at the beginning of each semester and the pairing of two advanced courses in the second half of each semester. This new schedule supports student success by allowing students to start in introductory level courses at the beginning of each semester. These course pairings also support student success by keeping their course load more manageable. They can meet in each course twice a week for 8 weeks allowing them to be focused in only two courses a week rather than 4 separate courses a week and still complete 4 courses in a semester. MATH 60 advisory has been removed and ESYS-004 advisory has been added to help students develop the applied math skills necessary for the trades.

20. a. Cross-Listed Course (Enter Course Code): *N/A*
b. Replacement Course (Enter original Course Code): *N/A*

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21. Grading Method (*choose one*): Letter Grade Only

22. MIS Course Data Elements

- a. Course Control Number [CB00]: CCC000203903
- b. T.O.P. Code [CB03]: 94600.00 - Environmental Control Tec
- c. Credit Status [CB04]: D - Credit - Degree Applicable
- d. Course Transfer Status [CB05]: C = Non-Transferable
- e. Basic Skills Status [CB08]: 2N = Not basic skills course
- f. Vocational Status [CB09]: Possibly Occupational
- g. Course Classification [CB11]: Y - Credit Course
- h. Special Class Status [CB13]: N - Not Special
- i. Course CAN Code [CB14]: N/A
- j. Course Prior to College Level [CB21]: Y = Not Applicable
- k. Course Noncredit Category [CB22]: Y - Not Applicable
- l. Funding Agency Category [CB23]: Y = Not Applicable
- m. Program Status [CB24]: 1 = Program Applicable

Name of Approved Program (*if program-applicable*): AIR CONDITIONING AND REFRIGERATION

Attach listings of Degree and/or Certificate Programs showing this course as a required or a restricted elective.)

23. Enrollment - Estimate Enrollment

First Year: 27

Third Year: 27

24. Resources - Faculty - Discipline and Other Qualifications:

- a. Sufficient Faculty Resources: Yes
- b. If No, list number of FTE needed to offer this course: N/A

25. Additional Equipment and/or Supplies Needed and Source of Funding.

N/A

26. Additional Construction or Modification of Existing Classroom Space Needed. (*Explain:*)

N/A

27. FOR NEW OR SUBSTANTIALLY MODIFIED COURSES

Library and/or Learning Resources Present in the Collection are Sufficient to Meet the Need of the Students Enrolled in the Course: Yes

28. Originator George Brown Origination Date 03/31/16