COLLEGE OF THE DESERT

Course Code ACR-065

Course Outline of Record

1. Course Code: ACR-065
2. a. Long Course Title: Air Conditioning & Refrigeration Electricity II
   b. Short Course Title: AIR COND/REF/ELEC II
3. a. Catalog Course Description:
   This course introduces the procedures, techniques and instruments utilized for troubleshooting the motors, circuitry and control elements for air conditioning and refrigeration equipment. Variations in control systems, including solid state, are described and analyzed.
   b. Class Schedule Course Description:
   Introduces to the procedures, techniques and instruments utilized for troubleshooting motors, circuitry and control elements.
   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 (CCForm1-A)
   Prerequisite: ACR 064
   Advisory: RDG 061
   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 - Compute the value of expressions containing natural number exponents.
   - 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 - Employ decimal notation and place value to compare, order, and round numbers.
   - 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.

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. Read electrical diagrams.

- ACR 064 - Read electrical diagrams.

j. Use electrical test equipment.

- ACR 064 - Use electrical test equipment.

k. Troubleshoot electrical circuit.

- ACR 064 - Troubleshoot electrical circuit.

l. Demonstrate an understanding of basic theory behind electrical and electronic components.

- ACR 064 - Demonstrate an understanding of basic theory behind electrical and electronic components.

m. Demonstrate an understanding of how components work together to control Air Conditioning equipment.

- ACR 064 - Demonstrate an understanding of how components work together to control A/C equipment.

n. Use various reading strategies to prepare, read and comprehend expository text

- RDG 061 - Use SQ3R &/or SOAR along with outlining, note-taking, mapping summarizing and other strategies to prepare, read, & comprehend expository text.

o. Read a variety of texts fluently

- RDG 061 - Read a variety of texts fluently.

p. Write organized summaries & reactions that capture main idea and supporting details

- RDG 061 - Write organized summaries & reactions that capture main idea and supporting details.
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q. Understand multiple word meanings, uses & synonyms

- RDG 061 - Understand multiple word meanings, uses & synonyms

8. Course Content and Scope:

Lecture:

a. Electrical Safety
b. Air Conditioning and Refrigeration System Control Philosophies
c. Types of Control Systems
d. Control System Components, description, operation, adjustments and replacement
    i. Temperature Controllers
    ii. Pressure Operators
    iii. Timing devices
    iv. Protective devices
    v. Indicators
e. Control System Troubleshooting
f. Motor Troubleshooting and Repair
g. Selection of alternative replacement or circuit components

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. Test motors and controls
5. practice proper tool usage

9. Course Student Learning Outcomes:
   1. Identify and discuss application of motors and control circuits found in residential and light commercial HVACR systems.
   2. Diagnose electrical and mechanical problems and describe solutions for residential and light commercial HVACR systems.
   3. Use industry tools and equipment to install, maintain and service electrical motors and circuits in residential and light commercial HVACR systems.

10. Course Objectives: *Upon completion of this course, students will be able to:*
    a. Demonstrate an understanding of electric meters and their proper use.
    b. Describe air conditioning circuit components such as capacitors and motors and how they work.
    c. Demonstrate an understanding of the basic knowledge on how a motor works and how it is protected from damages.
    d. Diagnose electric motor problems that commonly occur on air conditioning and refrigeration system.
    e. Diagnose air conditioning and refrigeration control malfunctions.
    f. Perform adjustments on control devices commonly found on air conditioning and refrigeration systems.
    g. Select alternative replacement components for existing circuit components.
    h. Design control circuits to satisfy specific dictated operating conditions and parameters.
    i. Utilize electrical test equipment effectively and safely.

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*
    a. Demonstration, Repetition/Practice
    b. Discussion
    c. Laboratory
    d. Lecture
    e. Observation
    f. Participation
    g. Technology-based instruction

    Other Methods:

    Videos/slides/CD presentation

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. Students skills inventory to promote critical thinking
       2. Delmar Online Training Simulation
       3. NATE Preperation Online Study Guide
       4. Mind Tap
    b. Out-of-class Assignments
       1. Reading assignments
       2. Attendance at trade shows
       3. Assign problems and questions appearing in the textbooks
       4. Complete laboratory assignments
       5. Delmar Online Training Simulation

6. NATE Preperation Online Study Guide
7. Mind Tap

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*
    - Written homework
    - Laboratory projects
    - Presentations/student demonstration observations
    - Group activity participation/observation
    - True/false/multiple choice examinations
    - Mid-term and final evaluations
    - Student participation/contribution

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

17. Special Materials and/or Equipment Required of Students:
    1. Loose leaf Notebook
    2. Pocket Calculator
    3. Safety Glasses
    4. Ear plugs
    5. Work Gloves

18. Materials Fees: ☐ Required Material?

Material or Item	Cost Per Unit	Total Cost

19. Provide Reasons for the Substantial Modifications or New Course:

    Change advisory from English to Reading

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

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

22. MIS Course Data Elements
    a. Course Control Number [CB00]: CCC000415248
    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]: Clearly 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 10/24/17