COLLEGE OF THE DESERT

Course Code ACR-061

Course Outline of Record

1. Course Code: ACR-061
2. a. Long Course Title: Air Conditioning & Refrigeration II
   b. Short Course Title: AIR CONDTNG/REFRG II
3. a. Catalog Course Description:
   Basic types of compressors are introduced. This course covers operation of condensers within the refrigeration system. Basic evaporation process is studied. Metering devices are included with an emphasis on the specifics of modulating and fixed orifice controls. Laboratory experience provides the student an opportunity to practice the methods and techniques presented in the classroom.
   b. Class Schedule Course Description:
   Develops additional skills and knowledge for the mechanical refrigeration system.
   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 060 with a minimum grade of C
   Advisory: ESYS 004
   Advisory: RDG 061
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. Apply the order of operations to simplify expressions involving several operations.
   - ESYS 004 - Apply the order of operations to simplify expressions involving several operations.

   b. Understand the use of rounding and estimation and use these skills to solve problems.
   - ESYS 004 - Use rounding and estimation skills to solve problems.

   c. 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.

   d. 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.

   e. Understand percent and convert between percents, decimals, and fractions.
   - ESYS 004 - Apply methods of conversion between percentages, decimals, and fractions.

   f. 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.

g. Understand and use basic concepts and formulas from geometry, including perimeter, area and volume.

- ESYS 004 - Apply the order of operations to simplify expressions involving several operations.
- ESYS 004 - Apply the basic operations to solve application problems.
- ESYS 004 - Determine the solution to equations involving percentages by deductive reasoning.
- ESYS 004 - Use unit measure appropriately in applications.

h. Explain the operation of the mechanical refrigeration cycle.

- ACR 060 - Explain the operation of the mechanical refrigeration cycle.

i. Identify and explain the operation, purpose and construction of the major components found in the mechanical refrigeration cycle.

- ACR 060 - Identify and explain the operation, purpose and construction of the major components found in the mechanical refrigeration cycle.

j. Use tools, equipment and materials to perform silver brazing operations on copper, steel and brass refrigeration lines and fittings.

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k. Demonstrate an understanding of the two aspects of comfort air conditioning.

- ACR 060 - Demonstrate an understanding of the two aspects of comfort air conditioning.

l. Identify the chemical make-up of the refrigerant gasses and their place on the temperature scale.

- ACR 060 - Identify the chemical make-up of the refrigerant gasses and their place on the temperature scale.

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

n.
Read a variety of texts fluently

8. Course Content and Scope:

Lecture:

1. Compressors
    1. Compressor functions
    2. Types of compressors
        1. Reciprocating compressors
        2. Rotary compressors
        3. Scroll compressors
        4. Screw compressors
        5. Centrifugal compressor
2. Condensers
    1. Condenser operation
    2. Condenser capacity
    3. Types of condensers
        1. Air cooled
        2. Water cooled
3. Evaporators
    1. Evaporator function
    2. Evaporated capacity
    3. Types of evaporators
        1. dx coil
        2. water coil
4. P-H Diagrams
    1. plotting refrigeration Cycle
5. Chilled water systems
6. Metering Devices
    1. Operation
    2. Types of metering devices

1. Fixed metering devices
2. Adjustable metering devices
3. Liquid distributors
4. Troubleshooting

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

1. Compressors
    1. Compressor functions
    2. Types of compressors
        1. Reciprocating compressors
        2. Rotary compressors
        3. Scroll compressors
        4. Screw compressors
        5. Centrifugal compressor
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4. Metering Devices
    1. Operation
    2. Types of metering devices
        1. Fixed metering devices
        2. Adjustable metering devices
        3. Liquid distributors
        4. Troubleshooting
5. Soldering and brazing.

9. Course Student Learning Outcomes:
    1. Describe different means of compression found in reciprocating, rotary, screw, scroll and centrifugal compressors.
    2. Perform repairs for service, maintenance and installation.
    3.
    Gather critical information on air conditioning and refrigeration systems. conduct a total system analysis and make necessary adjustments to airflow, sub-cooling and super heat.

10. Course Objectives: *Upon completion of this course, students will be able to:*
    a. Predict and explain the changes in operation that occur when the refrigeration machine is operated at conditions inside and outside of its design conditions.
    b. Calculate or estimate the operating parameters for compressor machine operating at conditions inside and outside its design conditions.
    c. Apply calculated and estimated operating parameters along with observed indicators to diagnose malfunctions in air conditioning and refrigeration machines.

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. 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. Hands-on laboratory
2. Student skills inventory to promote critical thinking
3. Delmar Online Training Simulation
4. NATE preparation online study guide
5. Mind Tap
b. Out-of-class Assignments
1. Readings in the textbooks.
2. Hands-on laboratory assignment
3. Attendance at trade shows
4. Student skills inventory to promote critical thinking
5. Delmar Online Training Simulation
6. Mind Tap
7. NATE preparation online study guide

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*
- Written homework
- Laboratory projects
- Group activity participation/observation
- Product/project development evaluation
- Mid-term and final evaluations
- Student participation/contribution
- Organizational/timelines assessment

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. 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

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]: CCC000209156
    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