COLLEGE OF THE DESERT

Course Code ACR-092

Course Outline of Record

1. Course Code: ACR-092
2. a. Long Course Title: Advanced Building Automation Networks and Programming
   b. Short Course Title: BLDG AUTO NETWORKS
3. a. Catalog Course Description:
   Programming HVAC direct digital controllers using line (text) programming, icon based programming, and template programming. Stresses good programming practices including complete program documentation.
   b. Class Schedule Course Description:
   Advanced programming HVAC direct digital controllers and program documentation.
   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)
   Advisory: ESYS 004
   Advisory: RDG 061
   Prerequisite: ACR 090 and
   Prerequisite: CIS 010
6. Textbooks, Required Reading or Software: *(List in APA or MLA format.)*
   a. Auvil,Ronnie j. (2013). *HVAC Control Systems* (Third /e). Orland Park American Technical Publishers. ISBN: 9780826907646
   College Level: Yes
   Flesch-Kincaid reading level: 11.5
   b. ASHRAE (2009). *Standard 135-2008 -- BACnet® – A Data Communication Protocol for Building Automation and Control Networks (ANSI Approved)* (1st/e). ASHRAE.
   College Level: Yes
   Flesch-Kincaid reading level: 11
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.
   Apply the basic operations to solve application problems.
   - ESYS 004 - Apply the basic operations to solve application problems.

   c.
   Comprehend 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.
Use the concept of ratio to determine the solution to a proportion problem.

- ESYS 004 - Use the concept of ratio to determine the solution to a proportion problem.

e.
All of the courses in the Computer Information Systems program require students to learn to think critically.

- CIS 010 - All of the courses in the Computer Information Systems program require students to learn to think critically.

f.
Using computers effectively requires that students can express their instructions in a form that the computer program can understand and execute.

- CIS 010 - Using computers effectively requires that students can express their instructions in a form that the computer program can understand and execute.

g.
Students must understand what they want to accomplish, what logical steps are required to accomplish the objective, and how to submit instructions to the computer to achieve the required objective.

- CIS 010 - Students must understand what they want to accomplish, what logical steps are required to accomplish the objective, and how to submit instructions to the computer to achieve the required objective.

h.
Demonstrate skills in disk and file management.

- CIS 010 - Demonstrate skills in disk and file management.

i.
Demonstrate skills to design and create spreadsheets using common formatting and editing commands, formulas, and functions.

- CIS 010 - Demonstrate skills to design and create spreadsheets using common formatting and editing commands, formulas, and functions.

j.
Adjust or repair pneumatic transmitters and receiver controllers.

- ACR 090 - Perform adjustments or repairs on pneumatic transmitters and receiver controllers.

k.
Adjust or repair pneumatic sensors and controlled devices final.

- ACR 090 - Perform adjustments or repairs on pneumatic sensors and controlled devices final.

l.
Adjust or repair digital controllers.

- ACR 090 - Perform adjustments or repairs on digital controllers.

m.
Adjust air distribution control components.

- ACR 090 - Perform adjustments on air distribution control components.

n.
Adjust or repair digital sensors and final controlled devices.

- ACR 090 - Perform adjustments or repairs on pneumatic sensors and controlled devices final.

o.
Compare Analog vs. Digital

- ACR 090 - Compare analog vs. digital control signals.

p.
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.

q.
Read a variety of texts fluently

- RDG 061 - Read a variety of texts fluently.

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

- RDG 061 - Write organized summaries & reactions that capture main idea and supporting details.

s.
Understand multiple word meanings, uses & synonyms

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

8. Course Content and Scope:

Lecture:

1. Application specific controllers
2. General purpose controllers
3. Control signals
4. Flowcharts
5. Programming schedules
6. Programming logic
7. Graphical user interface
8. Text based programming
9. Graphic design
10. Final

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

1. Computer setup.
2. Network setup.
3. Proprietary programming.
4. Text based programming.
5. LonTalk programming.
6. BACnet programming.
7. Controller, network, and graphic design.
8. System monitoring and troubleshooting.

9. Course Student Learning Outcomes:

1.
Identify various programming methods used for building automation to be able to make adjustments on current existing building program sequences.

2.
Demonstrate effective programming skills and sequences. The student will use the skills to produce quick and efficient programs.

3.
Develop programming strategies to implement in older buildings which don't have all the required hardware in place.

4.
Evaluate programming methods to give controls recommendations to building owners.

5.
Propose system and program design for preliminary proposal development.

6.
Produce program documentation to track any changes to building controls strategies. e.g. controls specifications and plans.

10. Course Objectives: *Upon completion of this course, students will be able to:*
    a. Explain the process of automated building controls programming.
    b. Explain automatic building controls network setup.
    c. Test and add commands to proprietary programming.
    d. Test and adjust text based programming.
    e. Test and adjust LonTalk programming commands.
    f. Test and adjust BACnet programming commands.
    g. Change or adjust buildings controls programmed schedules.
    h. Change or adjust graphical user interface (GUI).
    i. Calibrate or program control signals.
    j. Write control programming flowcharts.

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*
    a. Activity
    b. Collaborative/Team
    c. Discussion
    d. Participation
    e. Technology-based instruction

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. Draw a control diagrams for HVAC systems, Lighting systems and plumbing systems. 2. Prepare a synopsis, in writing, of the differences between pneumatic and digital control systems. 3. Reading assigned chapters. 4. Class discussion. 5. Group interaction and presentation.

6. Evaluate industry.
7. Evaluate industry tools.

b. Out-of-class Assignments

1. Read assigned text.
2. Industry journal entry.
3. Assigned worksheets.
4. Evaluate energy bill.
5. Evaluate energy rebates and incentives.
6. Prepare for in-class discussions on specific energy topics.
7. Case studies.
8. Review end of chapter questions.

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*
    - Laboratory projects
    - Computational/problem solving evaluations
    - True/false/multiple choice examinations
    - Mid-term and final evaluations
    - Student participation/contribution
    - Student preparation
    - 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.

PO-BS Problem Solving

Use a variety of solution methods and techniques, for example, making a sketch, systematic listing, using the solution of a simpler (but related) problem.
Recognize the importance of checking a proposed solution to verify that it satisfies the requirements of a problem.
Recognize that a solution may not be possible, given limits of time, money, or other finite resources.
Identify what isn't known, but needs to be known in order to solve a problem (depending on the problem domain, reading and/or mathematical skills are helpful).

IO - Critical Thinking and Communication

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:

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]: CCC000579050
    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]: Advanced 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: 20
    Third Year: 30

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