<table>
<thead>
<tr>
<th>Course Information</th>
<th>Instructor Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioning Control Principles, HART 1403-31211</td>
<td>Chris Colquitt</td>
</tr>
<tr>
<td>Fall 2015</td>
<td><a href="mailto:chriscolquitt@dcccd.edu">chriscolquitt@dcccd.edu</a></td>
</tr>
<tr>
<td>Business/Technology</td>
<td>972-860-8171</td>
</tr>
<tr>
<td>Class will meet</td>
<td>Nov 10, 2014 – Dec 16, 2015</td>
</tr>
<tr>
<td>Class time</td>
<td>8:00 AM – 12:15 PM, MTWTH</td>
</tr>
<tr>
<td>Office Location: H-113C</td>
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</tbody>
</table>

Course Description
A basic study of HVAC and refrigeration controls; troubleshooting of control components; emphasis on use of wiring diagrams to analyze high and low voltage circuits; a review of Ohm’s law as applied to A/C controls and circuits.

- **Note:** A minimum of 9 hours per week should be devoted to course material outside of class time
  - A. Refrigeration and Air Conditioning technology 7th edition (Whitman, Johnson, and Tomczyk)
  - B. Electricity for Refrigeration, Heating, and Air Conditioning
  - C. 1-1/2” Three-ring binder, page protectors, dry-erase fine point markers

Course Prerequisites
Basic Electricity

Disclaimer –
The instructor reserves the right to amend this Syllabus as necessary.

Texas Core Objectives for Student Learning
Students will develop the essential knowledge and skills they need to be successful in college, in a career, in their communities, and in life. In this course, the following skills are in focus.

1. **Critical Thinking Skills** - to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information
2. **Communication Skills** - to include effective development, interpretation and expression of ideas through written, oral and visual communication
3. **Empirical and Quantitative Skills** - to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions
4. **Teamwork** - to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal
5. **Personal Responsibility** - to include the ability to connect choices, actions and consequences to ethical decision-making
6. **Social Responsibility**: to include intercultural competence, knowledge of civic responsibility, and the ability to engage effectively in regional, national, and global communities
Student Learning Outcome

The student will exhibit knowledge to test, repair, and/or replace HVAC-related electrical components; and read, draw, and interpret high and low voltage control circuits.

Course goals

The following list of course goals will be addressed in the course. These goals are directly related to the performance objectives.

UNIT 1

1. Apply motor theory principles to wiring diagrams
2. Determine proper voltage readings on wiring diagrams
3. Determine replacement parts for compressors
4. Trace circuits on diagrams of central air conditioners that include:
   a. PSC motors
   b. CSCR motors
   c. Shaded pole motors
   d. CS motors
   e. Three phase motors
   f. Multi-speed motors
   g. Crankcase heaters
   h. Time delays
   i. Low pressure switches
   j. High pressure switches
   k. Contactors
   l. Starters
   m. Control relays
   n. Thermostats
   o. Fan Relays
   p. Overloads
   q. Positive temperature coefficient devices (PTC)
   r. Gas valves
   s. Resistive heaters
   t. Limit switches
   u. Sequencers
5. Use a voltmeter to determine the condition of components in a central air conditioner
6. Use an ohmmeter to determine the condition of components in a central air conditioner
7. Use an ampmeter to determine the condition of components in a central air conditioner
UNIT 2

1. Troubleshoot diagrams of central air conditioners that include:
   a. PSC motors
   b. CSCR motors
   c. Shaded pole motors
   d. CS motors
   e. Three phase motors
   f. Multi-speed motors
   g. Crankcase heaters
   h. Start winding used as a crankcase heater
   i. Time delays
   j. Low pressure switches
   k. High pressure switches
   l. Contactors
   m. Starters
   n. Control relays
   o. Thermostats
   p. Single transformer circuits
   q. Dual transformer circuits
   r. Lock-out relays
   s. Fan relays
   t. Overloads
   u. Positive temperature coefficient devices (PTC)
   v. Gas valves
   w. Resistive heaters
   x. Limit switches
   y. Sequencers

2. Identify parts and locate pertinent information on central air conditioners, gas furnaces, and electric furnaces

3. Remove and replace fan motors

4. Remove, check, and install electrical components

5. Wire condensing units
Assignments are made in class and will be posted on eCampus. Some assignments will be printed and distributed in class. Some assignments will only be made orally in class. Students will not be continually reminded of assignments. Following both written and oral directions without reminders is one way by which the student’s applications of study skills are mastered.

**Pop tests**
You will have several pop tests during the semester. The final pop test grade will be the average of all the pop tests. The rust buster will be counted as a pop test. Pop tests may be given at any time during class. All pop tests will be taken up at the same time. If you are late and no one has finished the pop test and left the room, you will be allowed to take the pop test, but will not be allowed any extra time. Pop tests cannot be made up. **If you miss the pop test, you will receive a zero.** See the instructor for a copy of any missed pop tests.

**Homework**
You will have several homework assignments. The final homework grade will be the average of all the homework assigned. All homework is due at the beginning of class. If you miss turning in your homework when due, you will receive a zero for that homework. **Late homework will not be accepted.**

**Lab exercises**
Lab exercises are to be completed during assigned class time. Each student is expected to perform all lab exercises. You may discuss, consult, and observe others in the lab; however, YOU must complete YOUR lab exercise. **If you turn in your lab late, you will receive a zero.**

Students are required to have their own tools in order to perform the lab exercises. **A student that does not have his tools with him will lose 50% of the lab score.**

**Lab exam**
This course is structured so that 400 points of a possible 1000 are earned in the lab. 100 of these are earned by lab exams. This is where you will demonstrate acquired skills and knowledge. In order to take the lab exam the student must;

1. Be present in the lab at the time scheduled. There are no makeup lab exams if you miss class on lab exam day.
2. Have the required tools. **If you have to borrow tools from the tool room or from another student, you will receive a 50 point deduction on the exam.**
3. Have tools marked with student ID. **50 points will be deducted if tools are not marked**
4. Have completed lab exercises.
**Final exam**
Major exams will be given over the material covered in class to include all lectures, pop tests, home work, demonstrations, and assigned class work. Each test will be comprehensive, to include material covered in the previous exam or semester.

**NOTICE:** You cannot "Make Up" exams unless you have made specific arrangements with the instructor BEFORE the scheduled exam. In order for you to take the exam, you must be present at the time the exam is handed out. If you are late, you will not be allowed to take the exam.

**Bonus Option**
Bonus option points are given for additional time spent studying under the supervision of a tutor or instructor. Bonus option points may be earned for extra time you spend in the lab or studying with the tutor. Tutors may be available in the lab Friday and Saturday mornings. **Bonus option forms must be signed by the tutor or instructor on the day the time is acquired.** For each hour you have in bonus option time you will earn 1.667 points. These points are added to the total of all points earned.

**Evaluation Procedures**
Your performance objectives and exams will be translated to points and the points to grades. There are 1000 points possible and grades will be earned as follows; A = 1000 - 895, B = 894 - 795, C = 794 - 695, D = 694 - 595, F = below 595.

**Grading Scale**

1. Pop tests 100 points
2. Homework 50 points
3. Tool Test 50 points
4. Lab exercises 300 points
5. Lab exam 100 points
6. Major Exam 200 points
7. Final exam 200 points

Total 1000 points
**Stop Before you Drop**

For students who enrolled in college level courses for the first time in the fall of 2007, Texas Education Code 51.907 limits the number of courses a student may drop.

You may drop no more than six courses during your entire undergraduate career unless the drop qualifies as an exception. Your campus counseling/advising center will give you more information on the allowable exceptions.

Remember that once you have accumulated six non-exempt drops, you cannot drop any other courses with a “W”. Therefore, please exercise caution when dropping courses in any Texas public institution of higher learning, including all seven of the Dallas County Community Colleges. For more information, you may access: [http://www.dcccd.edu/Why/Reg/Registration/Pages/default.aspx](http://www.dcccd.edu/Why/Reg/Registration/Pages/default.aspx)

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**Withdrawal Policy**

If you are unable to complete this course, it is your responsibility to withdraw formally. The withdrawal request must be received in the Registrar’s Office by **(Dec 8, 2015)**. Failure to do so will result in your receiving a performance grade, usually an “F.” If you drop a class or withdraw from the college before the official drop/withdrawal deadline, you will receive a “W” (Withdraw) in each class dropped. See institutional policies for additional information on withdrawals.

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**Attendance Policy**

Student are expected to attend all class sessions. A large amount of material is covered each day. This material cannot be repeated solely because a few students missed a class. Past experience indicates that the surest way to get a poor grade is to not come to class.

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**Emergency Closings**

Check DCCCD website for campus closings. You can also sign up to get notifications by email or text. Go to website and find out how.

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**Classroom Policies**

Optional: enter your specific classroom policies (e.g., food, drink, cell phone, etiquette, etc). Remove this text if you have no policies to add.

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**Course Outline**

For maximum success in this course you should spend a **minimum** of 9 hours per week working on course material.
INSTITUTIONAL POLICIES

Academic Advising

Academic Advising is a collaborative educational process whereby students and their advisors are partners in meeting the students' academic, personal, and career goals. This partnership is a process that is built over the student’s entire educational career at Cedar Valley College.

Educational planning is available to all students. First time in college students must meet with academic advisors prior to enrolling in classes; however, continuing students may choose to see faculty advisors, faculty counselors, and/or program coordinators after classes begin. All parties have clear responsibilities for ensuring a successful partnership. For more information, you may access:

https://www.cedarvalleycollege.edu/FutureStudents/StudentServices/AcademicAdvising/Pictures/AdvisingSyllabus.pdf

Academic Honesty

Academic honesty is expected, and integrity is valued in the Dallas County Community Colleges. Scholastic dishonesty is a violation of the Code of Student Conduct. Scholastic dishonesty includes, but is not limited to, cheating on a test, plagiarism, and collusion.

ADA Statement

If you are a student with a disability and/or special needs who requires accommodations, please contact the college Disability Services Office at 972-860-8119.

Emergency Alert

Sign up for DCCCD Emergency Alerts to receive a text-message, e-mail and/or phone call when there is an unscheduled evacuation or closure of a DCCCD campus or office because of weather closures, utility outages, police or other emergencies. Subscribing is free, but standard text message charges from your cell phone provider will apply. Please refer to:

http://www.dcccd.edu/SS/OnlineSvs/EmergAlerts/Pages/default.aspx

Financial Aid

Students who are receiving any form of financial aid should check with the Financial Aid Office prior to withdrawing from classes. Withdrawals may affect your eligibility to receive further aid and could cause you to be in a position of repayment for the current semester. Students who fail to attend or participate after the drop date are also subject to this policy.
Health Center Services

- Basic first aid for minor cuts, scrapes, insect stings, and heat, etc.
- Over-the-counter medications for headaches, fever, seasonal allergies, and colds
- Over-the-counter medications for mild allergic reactions
- Emergency sanitary pads
- Blood Pressure check
- Coordination with outside health agencies such as Carter Blood Care; Dallas County Health Dept. (HIV/STD testing--free, twice a semester); UT Southwestern mobile mammography; Immunizations once a month for children <19 y.o. from the DCDHHS; Agape Massage; and Employee Wellness Screening
- Rest area for stress relief, migraine headaches, post seizure activity
- AED (Automatic External Defibrillator) for CPR
- Confidential "talks"
- Assists with health related club activities when asked and time permits

Honors Credit Availability

You can earn Honors Credit in this course that will show the completion of an Honors Course on your transcript. Honors credit is important in transfer evaluation for graduation with both Associates and Bachelor degrees with honors. To gain Honors credit for this course you will need to:

1. Demonstrate advanced writing skills through synthesis and original thought in expanded writing projects, research papers, and critical essays. This will entail a minimum of ten pages of writing. You will be asked to read primary sources readings besides the textbook
2. Participate in an outside class activity by attending a lecture, exhibit or program outside of the class activities
3. You will practice your oral presentation skills with a 10-minute presentation to the class about a topic that you have researched

To qualify for Honors credit, you must sign an Honors Contract at the beginning of the semester. Meet with me to design your program and complete the contract form by (Insert appropriate dates for current semester) in order to meet the (Insert appropriate dates for current semester) deadline for submission of Honors Contracts for approval. Finally, you must earn an A or B in the course in order to receive Honors Credit.
Religious Holidays
Absences for observance of a religious holy day are excused. A student whose absence is excused to observe a religious holy day is allowed to take a make-up examination or complete an assignment within a reasonable time after the absence.

Repeating this Course
Effective for Fall Semester 2005, the Dallas County Community Colleges will charge additional tuition to students registering the third or subsequent time for a course. This class may not be repeated for the third or subsequent time without paying the additional tuition. Third attempts include courses taken at any of the Dallas County Community Colleges since the fall 2002 semester. More information is available at:
http://www.dcccd.edu/PC/Cost/3rdCrseAttmpt/Pages/default.aspx

Student Code of Conduct
As a college student, you are considered a responsible adult. Your enrollment indicates acceptance of the DCCCD Code of Student Conduct published in the DCCCD Catalog. More information is available at:
https://www1.dcccd.edu/catalog/ss/code.cfm?loc=CVC

Tutoring Services
Tutoring will be held in the A/C lab on Friday and Saturday during the hours of 8am to 12pm.

QUALITY ENHANCEMENT PLAN
Cedar Valley College's Quality Enhancement Plan is designed to improve student learning in mathematics. Read more about our QEP at:
http://www.cedarvalleycollege.edu/QEP/default.aspx
NOTE: Students will only be allowed half credit on lab exercises and lab exams if they have to borrow tools. Each student must furnish a set of handtools for laboratory performance in the courses listed below. All tools must be marked with the owner's identification. Tools may not be shared between students. A limited number of lockers are provided in the air conditioning laboratory. Each student must provide their own lock.

The lock and tools must be removed from the lockers by the student at the end of each semester. Any locks or tools remaining in the locker after the end of each semester will be removed by the staff.

HART 1356, HART 2401, and HART 2445 do not require tools.

<table>
<thead>
<tr>
<th>HART</th>
<th>1401</th>
<th>1403</th>
<th>1407</th>
<th>1441</th>
<th>1445</th>
<th>2436</th>
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<tr>
<td>2. Volt-Ohm meter with Mega ohm</td>
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<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<td>3. Clamp-on amp meter</td>
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<td>4. Hollow shank nut drivers 1/4-5/16-</td>
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<td>7. 3 regular screwdrivers</td>
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<td>8. 3 phillips screwdrivers</td>
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<td>9. Pocket thermometer</td>
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<td>10. Refrigerant manifold for R-22</td>
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<td>11. Refrigerant manifold for R-410a</td>
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<tr>
<td>12. Chargefaster</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>13. Psychrometer</td>
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<td>14. Gas manometer</td>
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<td>15. Small and large adjustable</td>
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<td>16. Refrigeration ratchet</td>
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<td>17. Needle nose pliers</td>
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<td>18. Common pliers</td>
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<tr>
<td>20. Combination wrench set 1/4&quot; - 3/4&quot;</td>
<td>✓</td>
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<tr>
<td>21. Socket set 3/8&quot; drive</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>22. Halide or electronic leak detector</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>23. Hack saw</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>24. Mill file</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>25. Small three corner file</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>26. Flaring block with yoke</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>27. Tubing cutter</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>28. Swaging tools, 1/4, 5/16, 3/8, ½</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>29. Small ballpein hammer</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>30. Plastic or rubber mallet</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>31. Superheat thermometer</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>32. Low loss fittings, 2 per refrigerant</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>33. Flashlight</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>34. Tape measure</td>
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<td>✓</td>
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<td>✓</td>
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<tr>
<td>35. 10 Leads with alligator clips</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>36. Gloves</td>
<td>✓</td>
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<td>✓</td>
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A student may earn up to 50 additional points, on a 1000 point grading system, by using the Tutoring Services offered for Air Conditioning and Refrigeration. Time missed from class will be subtracted from the total bonus time. Bonus Option sheets must be signed on the day the time is acquired.

10 points for each 6 hours of tutoring.

### USE INK ONLY TO RECORD TIME

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