Course Description: Principles of electricity as required by HVAC technicians including proper use of test equipment, electrical circuits, and component theory and operation. The class will begin with basic electricity and progress through the study of transformers, power distribution, electric motors, motor controls and circuitry. The student will be introduced to the proper operation of various electrical meters and test instruments. This course, and HART 1407 must be taken first as the prerequisite to all the HART classes.

Text, References, and Supplies:
1. **ELECTRICITY FOR REFRIGERATION, HEATING, AND AIR CONDITIONING.**

   2. Industry Literature

Course Goals/Objectives: This course will focus on the basic skills needed to perform in the field as a beginning service technician. The student will learn how to use meters and test instruments, how to apply these test instruments to troubleshoot simple electrical problems. The student will learn motor principles and how to draw and construct the circuit for an operating air conditional system. The following list of course goals will be addressed in the course. These goals are directly related to the performance objectives. (* designates a CRUCIAL Goal)

*1. Display work habits.
2. Use safe work habits.
3. Define electrical terms.
4. Solve Ohm’s law.
5. Calculate total consumed power.
6. Explain voltage, current, and resistance relationship.
7. Identify three electrical insulators.
8. Identify three electrical conductors.
9. Calculate circuit power.
10. Draw complete simple circuit.
11. Identify series circuit.
13. Define electrical power.
15. Calculate circuit component current.
16. Calculate power usage.
17. Analyze parallel circuit.
*18. Show proper ohmmeter use.
*19. Measure circuit component resistance.
*20. Measure circuit resistance.
*21. Show proper voltmeter use.
*22. Measure circuit component voltage.
*23. Measure circuit voltage.
*24. Show proper ammeter use.
*25. Measure circuit component current.
*26. Measure circuit current.
27. Identify electrical components.
*29. Troubleshoot wiring diagram circuit.
30. Explain A/C power transmission.
31. Describe A/C waveform
32. Describe delta voltage systems.
33. Describe transformer operation.
34. List Delta connected transformer voltages.
35. List Wye connected transformer voltages.
36. Describe high voltage WYE systems.
37. Describe low voltage WYE systems.
38. List relay and contractor components.
39. List alternating current characteristics.
40. Identify different types of wire.
41. Solve problems involving supply voltage.
42. Solve problems involving wire size.
43. Identify different type motors.
44. Describe multi-speed single phase motor wiring.
46. Identify types of capacitors.
47. List capacitor replacement rules.
48. Define purpose of start and run capacitors.
49. Calculate parallel capacitor circuit output.
50. Calculate series capacitor circuit output.
51. Perform capacitor test.
52. Describe procedure for checking capacitor.
53. Describe 3 phase motor operation.
54. Describe 3 phase multi-voltage wiring.
*55. Describe connection of dual voltage motors.
56. List motor start relays.
57. Explain centrifugal switch operation.
58. Explain *hot wire* relay operation.
59. Explain *current* relay operation.
60. Explain *potential* relay operation.

* 61. Read *circuit diagrams*.
62. Connect 24-volt control circuit diagram.
63. Differentiate between *pilot duty* and *line duty* overloads.
* 64. Differentiate between *load* and *control circuit*.
65. Perform *compressor electrical test*.
* 66. Describe procedure for checking *compressor overload*.
67. Connect *three way switch circuit*.
68. Connect *four way switch circuit*.
69. Connect *line voltage stop-start circuit*.
70. Connect *low voltage stop-start circuit*.
71. Connect *thermal time delay circuit*.
* 72. Connect *push-button interlock circuit*.
* 73. Connect *solid state interlock circuit*.

**Student Contributions and Class Policies:**

Each student will spend at least 4 hours per week preparing for class. As a student in this class you are expected to display respect, professional behavior and a cooperative attitude at all times. Punctual attendance is critical in this class. This course will focus on the basic skills needed to perform in the field as a beginning service technician. The student will learn how to use meters as test instruments, how to apply these test instruments to troubleshoot simple electrical problems. The student will learn motor principles and how to draw and construct the circuit for an operating air conditioning system.

**Evaluation of Students:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab</td>
<td>30%</td>
</tr>
<tr>
<td>Quizzes &amp; Homework</td>
<td>25%</td>
</tr>
<tr>
<td>Attitude &amp; Attendance</td>
<td>20%</td>
</tr>
<tr>
<td>Final Examination</td>
<td>25%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Course Schedule:**

The class meets for 6 lecture hours and 6 lab hours per week for 8 weeks.

**SCANS Information:**

The following SCANS skills will be taught and/or
reinforced in this course:

ARITHMETIC/MATHEMATICS
Performs basic computations; uses tables, graphs, diagrams and charts to obtain or convey quantitative information. Expresses mathematical ideas and concepts orally and in writing.

THINKING SKILLS:
Recognizes problems and devises and implements plan of action: Uses efficient learning techniques to acquire and apply new knowledge and skills.

Safety Glass Policy:
It is required that all persons in the Air Conditioning Program wear eye protection while in the lab. Students are required to furnish their own protection. Visitors will be supplied with a pair of glasses to be used during their visit. If you have any questions about this policy, please ask your instructor to clarify them for you.

Instructor Information:
Jaroy Roberts, Instructor
Room 187 TC
(432) 685-4687 Office
(432) 349-5913 cell
E-Mail: jroberts@midland.edu
Office Hours: Posted

Curt Pervier, Applied Technology Dean
Lisa Hays, Applied Technology Secretary
Room 143A TC
(432) 685-4676
Fax: (432)685-6472

Students are encouraged to contact the instructor at any time; however, making an appointment will guarantee the instructor’s availability at a specific time.
Midland College provides services for students with disabilities through Student Services. In order to receive accommodations, students must place documentation on file with the Counselor/Disability Specialist. Students with disabilities should notify Midland College prior to the beginning of each semester. Student Services will provide each student with a letter outlining any reasonable accommodations. The student must present the letter to the instructor at the beginning of the semester.

*Students MUST actively participate by completing an academic assignment required by the instructor by the official census date. Students who so not actively participate in an academically-related activity will be reported as never attended and dropped from course.

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Spanish
Midland College no discrimina por motivos de raza, color, nacionalidad, sexo, discapacidad, o edad en sus programas o actividades. Las siguientes personas han sido designadas para responder a cualquier pregunta o duda sobre estas políticas no discriminatorias: Tana Baker, Title IX Coordinator/Compliance Officer, 3600 N. Garfield, SSC 242, Midland, TX 79705, (432) 685-4781, tbaker@midland.edu; Natasha Morgan, Director Human Resources/Payroll, 3600 N. Garfield, PAD 104, Midland, TX 79705, (432) 685-4534, nmorgan@midland.edu. Para más información sobre estas políticas no discriminatorias, visite http://wdrobcolp01.ed.gov/CFAPPS/OCR/contactus.cfm o llame al 1 (800) 421-3481.