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MIDLAND COLLEGE
SYLLABUS
HART 1401
BASIC ELECTRICITY FOR HVAC
3-3

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. **MODERN REFRIGERAION and AIR CONDITIONING. Current Edition.**

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.*
12. Draw *series circuit.*

13. Define *electrical power*.
14. Calculate *circuit resistance*.
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*.
28. Draw *electrical symbols.*

*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*.
45. State multi-speed blower motor *color code.*
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:

Lab	30%
Quizzes & Homework	25%
Attitude & Attendance	20%
Final Examination	25%
Total	100%

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.

Americans with Disabilities Act (ADA) Statement:

Midland College provides services for students with disabilities through Student Services. In order to receive accommodations, students must visit www.midland.edu/accommodation and complete the Application for Accommodation Services located under the Apply for Accommodations tab. Services or accommodations are not automatic, each student must apply and be approved to receive them. All documentation submitted will be reviewed and a "Notice of Accommodations" letter will be sent to instructors outlining any reasonable accommodations.

*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.

Midland College Non-Discriminatory Statement:

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