Correlation of

***Modern Refrigeration and Air Conditioning,* by Althouse, Turnquist, Bracciano**
(Goodheart-Willcox Publisher ©2021)
to
AHRI Curriculum Guide: VI. Electricity

The following chart correlates the *Modern Refrigeration and Air Conditioning* textbook (©2021) to a section of the Curriculum Guide developed by Air-Conditioning, Heating, and Refrigeration Institute (AHRI) and used for PAHRA accreditation.

The chart lists the Curriculum Guide's knowledge and task competency objectives and the corresponding chapter numbers from *Modern Refrigeration and Air Conditioning*.

For more information on the Partnership for Air-Conditioning, Heating, Refrigeration Accreditation (PAHRA) and related accreditation, please visit: www.pahrahvacr.org

VI.A. Basic Electricity	
Knowledge	**Textbook Chapter(s)**
1. Define *watts*, *ohms*, *volts*, and *amps*.	Chapter 12
2. Define and compare *single-* and *three-phase voltage* and *current*.	Chapter 13
3. Identify types of electrical loads (i.e., capacitive, inductive, and resistive).	Chapters 12, 13
4. Analyze applications of magnetism in electricity.	Chapters 12, 13, 14, 15, 16, 18
5. Apply magnetic principles to electrical therapy.	Chapters 12, 13, 15, 16
6. Compare conducting and insulating materials.	Chapter 12
7. Identify principles of solid-state switching devices.	Chapters 14, 16
Tasks	**Textbook Chapter(s)**
1. Demonstrate proper use of ammeter, ohmmeter, voltmeter, and wattmeter.	Chapters 13, 17, 53, 54

Correlation of *Modern Refrigeration and Air Conditioning* to AHRI Curriculum Guide:
VI. Electricity—page 2

VI.A. Basic Electricity (continued)	
Tasks	**Textbook Chapter(s)**
2. Use Ohm's Law to solve circuit problems and calculate circuit loads.	Chapters 12, 13, 17
3. Use appropriate meters to check basic electrical components.	Chapters 13, 17
4. Determine the electrical characteristics of both series and parallel circuits.	Chapters 12, 17
5. Demonstrate algebra/math skills.	Chapters 12, 13
6. Determine the equivalent resistance in a parallel and series circuit.	Chapter 12
7. Determine the equivalent capacitance in a parallel and series circuit.	Chapters 12, 18
8. Construct and analyze:	
a. series circuit	Chapter 12
b. parallel circuit	Chapter 12
c. series-parallel circuit	Chapter 12
VI.B. Electrical Generation and Distribution	
Knowledge	**Textbook Chapter(s)**
1. Explain basic generator principle.	Chapter 13
2. Explain how electricity is produced and distributed.	Chapter 13
3. Define *wye (Y)* and *Delta (∈)* distribution systems.	Chapter 13
Tasks	**Textbook Chapter(s)**
1. Draw and identify power transformer types.	Chapter 13
2. Use electrical meters appropriately to test and identify voltages in both single- and three-phase systems.	Chapters 13, 17
3. Size/test fuses/breakers and safely replace them.	Chapters 13, 16, 17
4. Use National Electrical Code (NEC) tables (i.e., NEC 310-16) to check wire size and conduit size for connected equipment.	Chapters 13, 16, 43
5. Determine correct wire size and voltage drops for electrical circuits.	Chapters 13, 17
6. Determine whether existing load centers are adequate to supply desired load additions.	Chapters 13, 18
VI.C. Electrical Components	
Knowledge	**Textbook Chapter(s)**
1. Define *magnetic theory*.	Chapters 12, 13, 15

VI.C. Electrical Components (continued)	
Knowledge	**Textbook Chapter(s)**
2. Define and explain the use or function of:	
a. aquastats	Chapter 39
b. capacitors	Chapter 12
c. contactor/starters	Chapters 16, 18, 53, 54
d. crankcase heaters	Chapter 19
e. current relays	Chapter 16
f. damper actuators	Chapters 16, 24, 25, 26, 29, 30, 36
g. defrost timers	Chapters 22, 23, 24, 40, 47
h. fan/limit controls	Chapters 36, 38, 41, 42, 43
i. oil pressure safety	Chapter 20
j. overloads	Chapters 18, 20, 32, 53
k. positive temperature co-efficient (PTC)	Chapters 14, 16, 17
l. potentiometers	
m. pressure controls	Chapters 13, 21, 44, 45, 51
n. relays	Chapters 14, 16, 17, 36, 41, 42, 43, 52, 53, 54
o. rheosotats	
p. sail switches	Chapters 41, 43
q. sequencers	Chapter 43
r. solenoids	Chapters 11, 14, 16, 22, 41, 42, 54
s. solid-state time delays	Chapters 14, 16, 18, 40, 41, 42, 53
t. thermostats	Chapters 16, 24, 26, 31, 32, 33, 36, 39, 40, 41, 42, 43, 53
u. water valves	Chapters 33, 35, 39, 53, 54
v. zone valves	Chapter 39
Task	**Textbook Chapter(s)**
1. Demonstrate proper use of test equipment for testing the above items.	Chapters 16, 17, 25, 26, 30, 41, 53, 54, 55
VI.D. Electric Motors	
Knowledge	**Textbook Chapter(s)**
1. Explain electric motor theory (i.e., magnetism, electromotive force, etc.)	Chapters 12, 13, 15

VI.D. Electric Motors (continued)	
Knowledge	**Textbook Chapter(s)**
2. Explain operation and application of:	
a. capacitor start induction run motor (csir)	Chapter 15
b. capacitor start capacitor run motor (cscr)	Chapter 15
c. electronically controlled motor (ecm)	Chapter 15
d. modulating motor (economizers)	Chapters 15, 18, 32, 33, 36
e. multi-speed motor	Chapter 15
f. permanent split capacitor motor (psc)	Chapter 15
g. shaded pole	Chapter 15
h. split-phase motor (rsir)	Chapter 15
i. three-phase motor	Chapter 15
j. variable-speed motor	Chapters 15, 31, 32, 33
3. Describe starting components associated with single-phase and three-phase motors.	Chapters 15, 16, 53, 54
4. Explain the significance of power factor.	Chapters 13, 17, 54
Tasks	**Textbook Chapter(s)**
1. Demonstrate proper use of testing equipment for motors.	Chapters 7, 15, 18
2. Determine physical conditions of motor bearings and rotors.	Chapters 15, 18
3. Build a basic motor-using a piece of wood, copper wire, and a coat hanger.	
4. Draw and explain the starting and nm circuit for a single-phase CSIR compressor using a current type starting relay.	Chapters 15, 16, 18, 25
5. Draw and explain the starting and 11m circuit for a single-phase CSCR compressor using a potential (metage) starting relay.	Chapters 15, 16, 18, 25
6. Draw and explain the circuit for a PSC compressor.	Chapters 15, 16, 18, 25
VI.E. Electrical Circuits and Controls	
Knowledge	**Textbook Chapter(s)**
1. Interpret detailed instructions for wiring circuits.	Chapters 16, 18, 31, 33, 42, 43, 53, 54
Tasks	**Textbook Chapter(s)**
1. Draw electrical circuits that conform to standard industry logic and symbols using appropriate loads and controls.	Chapters 12, 16, 17, 31, 33, 42, 43, 53, 54

Correlation of *Modern Refrigeration and Air Conditioning* to AHRI Curriculum Guide:
VI. Electricity—page 5

VI.E. Electrical Circuits and Controls (continued)	
Tasks	**Textbook Chapter(s)**
2. Wire actual electrical circuits from wiring diagrams.	Chapters 12, 17, 18, 31, 33, 42, 43, 53, 54
3. Demonstrate use and understanding of basic electrical meters in actual wiring and testing of circuits.	Chapters 12, 16, 17, 18, 31, 33, 42, 43, 53, 54
4. Identify and draw all electrical symbols used by the HVACR industry in diagrams.	Chapters 12, 16, 17, 18, 31, 33, 42, 43, 53, 54
5. Size an electric motor circuit, single and multiple, including overcurrent protection in accordance with National Electrical Code (NEC).	Chapters 12, 13, 15, 16, 17, 19, 20, 25, 32, 36, 43, 52, 55