

Houston Community College

CAREER AND TECHNOLOGY EDUCATION
HEATING, VENTILATION AND AIR CONDITIONING

COURSE SYLLABUS

COURSE NUMBER: Hart 1301

COURSE TITLE: Basic Electricity Principles

CREDITS: # (2 lectures, 3 labs)

PREREQUISITE/COREQUISITE: None

INSTRUCTOR:

COURSE DESCRIPTION

Principles of electricity as required by HVAC, including proper use of test equipment, electrical circuits, and component theory and operation.

END OF COURSE OUTCOMES

By studying this course, students will be able to:

1. Demonstrate an understanding of the basic principles of HVAC and career opportunities
2. Define principals of direct current (DC) and alternating current (AC)
3. Demonstrate knowledge of basic principles of electricity
4. Apply Ohm's law to electrical calculations
5. Measure resistance, voltage and amperage by using an analog or digital multimeter
6. Compute different electrical values using Ohm's law
7. Compute different electrical values using Watt's law
8. Identify safety devices, contactors, relays used in an electrical circuit

STUDENT LEARNING OUTCOMES

1. Given a lab assignment – AC/DC circuits, the student will differentiate between Direct Current (DC) and Alternating Current (A/C). Performance will be satisfactory; when the student can sketch the Sine waves and calculate the Ohm's law to determine voltage, current, and resistance by passing 80% on the lab assignments.
2. Given a lab assignment along with lectures, the student will demonstrate the use of measurement instruments to record voltage, current, and resistance. Performance will be satisfactory; when the student can operate the proper instrument to collect data – Voltage, Resistance, and Amperage; and correctly label a chart by passing 90% of accuracy on the practice.
3. Given a set of HVAC drawings, the student will identify piping and equipment; given a basic electrical circuit and diagrams, the student will identify the type of circuit and diagram, and electrical symbols. Performance will be satisfactory; when the student can identify components and interpret an electrical diagram and sequence current flow of individual circuits listed on schematic by passing 90% of accuracy on the practice.
4. Given a list of AC electrical components and a schematic, the student will be able to assemble all components by using a schematic. Performance will be satisfactory, when the student can connect an energized circuit and recognize a shorted circuit and evaluate the electrical safety practice by passing 100% of accuracy on the practice.
5. Give live "Energized" complex electrical circuit exercises, the student will analyze the Ohm's law. Performance will be satisfactory; when the student can differentiate the Series or Parallel circuits by

compiling given circuits by using the Ohm law rules based on the value of voltage, resistance, and amperage by passing 90% of accuracy on the practice.

COURSE POLICIES

Attendance

Students are expected to attend classes regularly, and to be on time for every class period. Students can be dropped from a class due to excessive absences. Excessive tardiness may be considered absences. Students are responsible for subjects, assignments, and projects covered during their absences. Consult the Student Handbook for more details or visit <http://www.hccs.edu/hccs/current-students>.

Academic Honesty

Scholastic dishonesty is treated with the utmost seriousness by the instructor and the College. Academic dishonesty includes, but it is not limited to the willful attempt to misrepresent one's work, cheat, plagiarize, or impede other students' scholastic progress. Consult the Student Handbook for more details.

Students with Disabilities

The Disability Support Services Office (DSSO) assists students with physical, learning, or emotional disabilities in developing independence and self-reliance. Students with Disabilities are urged to contact the DSSO at least 30 to 60 days prior to the first day of class. The goal is to ensure that students with disabilities get off to a good start and have the support necessary for them to succeed. The DSSO are committed to compliance with the Americans with Disabilities Act (ADA) and Rehabilitation Act of 1973 (section 504). Student can contact DSSO by phone at 713.718.6164 - TTY 713.718.6335. Fax 713.718.1468

Course Repeater Policy:

Beginning in the fall 2006, students repeat a course for a third or more times will face significant tuition/fee increases at HCC and other Texas public colleges and universities. Please ask your instructor and/or counselor about opportunities for tutoring/other assistance prior to considering course withdrawal or if you are not receiving passing grades.

Cell Phones

All cell phones must be muted, set to vibrate, or turned off during class. Cell phone activity during class is deemed disruptive to the academic process and will not be tolerated. If you need to make or receive an Emergency Call, please leave the classroom.

Calculators

If the course allows the use of a calculator during class, lab projects, and exams, the student is responsible to bring his/her calculator. Cell phones are not calculators, and are not allowed to be used for that purpose during class, tests, or exams.

Student ID

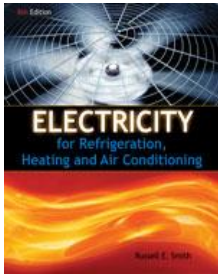
Students are required to obtain a Student ID. For additional information, consult the Student Handbook.

Parking Rules and Regulations

Students are required to follow HCC's regulations regarding parking and permits. For additional information, visit <http://www.hccs.edu/hccs/about-hcc/police/parking/parking-rules-and-regulations>

Books, Tools and Supplies

Students are required to purchase and bring to class the required textbooks, tools, notebooks, supplies, and writing instruments as required by the instructor. Tool list is available to student during the first day of class meeting.



Electricity for Refrigeration, Heating, and Air Conditioning, 8th Edition

Russell E. Smith Athens Technical College, Athens, Georgia

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Dress Code

Dress code must be appropriate for the class. Students must dress in a way that clothing and accessories do not compromise their safety, and the safety of others. Proper foot wear is required in all laboratories. Absolutely no sandals or other footwear that exposes the feet will be allowed.

Classroom and Laboratory Conduct

Proper behavior is expected in all classes and laboratories. Foul language and horseplay are not allowed. Making or receiving cell phone calls during class are not allowed. Sleeping in class is not allowed.

Course Withdrawal

It is the responsibility of the student to officially withdraw from a course before the official withdrawal deadline. A student who does not withdraw from a course by the deadline will receive an "F" as the final grade. Also note that under Section 51.907 of the Texas Education Code, an institution of higher education may not allow a student to drop more than six courses.

Student Evaluation Policies/Grading Scales

Class Participation	220	22%
Quiz (8 x 30)	240	24%
Lab (8 x 30)	240	24%
Midterm Examination	150	15%
Final Examination	150	15%
Total Possible Points	1000	-
Total Percentage	-	100%

Grading Points

The percentage of total points that students achieve is converted to a letter grade as follows:

90% - 100%	4.00	A
80% - 89%	3.00	B
75% - 80%	2.00	C
70% - 74%	1.00	D
69% - below	0.00	F

EGLS3 -- Evaluation for Greater Learning Student Survey System

At Houston Community College, professors believe that thoughtful student feedback is necessary to improve teaching and learning. During a designated time, you will be asked to answer a short online survey of research-based questions related to instruction. The anonymous results of the survey will be made available to your professors and division chairs for continual improvement of instruction. Look for the survey as part of the Houston Community College Student System online near the end of the term.

COURSE OBJECTIVES AND GOALS

Upon completion of this course, the student will be able to:

- Demonstrate knowledge of basic principles of HVAC and the role of electricity
- Define the terms of electricity and electronics
- List the three principal parts of the atom
- Explain the difference between direct current and alternating current
- State basic safety rules
- Discuss the origin and responsibilities of OSHA
- Discuss the properties of Series/Parallel circuits
- Apply Ohm's law to electrical calculations
- Compute different electrical values using Ohm's law
- Compute different electrical values using Watt's law
- Discuss the operation of voltmeter, ammeter, and Ohmmeter
- Measure resistance, voltage, and amperage by using an analog or digital multimeter
- Demonstrate adaptability by collaborating and planning a project with others
- Demonstrate ability to collect technical data from manuals and equipments by using Internet resources

COURSE OUTLINE, CONTENT GOALS AND ACTIVITIES

Week 1

Review syllabus and course procedures, requirements and assignments

Course description and learning outcomes

Required textbooks and tools

Class attendance and grading scales

Provide overview of HVAC careers, training and regulations

Electricity safety basics

Electrical safety procedures

Electrical safety devices

Quiz

Lab

Week 2

Introduction to electricity

Define principals of direct current

Discuss basic electron theory

Understand the basic physical properties of elements

List the three principal parts of an atom

State the law of charges

Discuss centripetal force

Discuss the difference between conductors and insulators

Differentiate different types of wire and insulation

Use the NEC chart

List factors that determine ampacity

Select a conductor from the proper wire table

Use correction factor to determine proper wire

Determine the proper wire size, the circular mil, K factor and conductor materials

Determine the resistance of long lengths of conductors

Quiz

Lab

Week 3

Identify and understand construction documents and drawings

Read and understand electrical circuitry

Identify electrical components, diagram types and electrical symbols

Recall an electrical circuit and define it

Identify different types of diagrams: pictorial, ladder and installation diagram

Recognize standard electrical symbols

Read schematic diagram

Interpret the sequence of operation

Learn rules of how to read a schematic

Recognize principles and application of magnetism

Discuss the properties of permanent magnets

Discuss the difference between the axis poles of the earth and the magnetic poles of the earth

Discuss the operation of electromagnets

Determine the polarity of an electromagnet when the direction of the current is known

Discuss the different systems used to measure magnetism

List magnetic devices used in the HVAC field

Quiz

Lab

Week 4

Define a coulomb

Define an ampere, a volt, an ohm and a watt

Apply Ohm's Law

Compute electrical values using Ohm's law

Select the proper Ohm's law formula from a chart

Practice principles of Voltage, Resistance, and Amperage by using Ohm's law

Define an electric circuit: controller, path, load and power supply

Calculate total voltage, total resistance and total amperage

Calculate voltage drop, current for each load
Calculate total wattage and wattage for individual load

Quiz

Lab

Mid term examination

Week 5

(Reading Assignment: HART 1301 Unit 6, Learning Web)

Practice application of electrical Laws – series circuits

Identify a series circuit

State three rules for solving electrical values of series circuit

Use Ohm's law

Calculate the value of total voltage, total current and total resistance

Calculate the voltage drop and current flow for each load

Calculate the wattage for each load and total wattage

Practice application of electrical laws – parallel circuits

Identify a parallel circuit

State three rules for solving electrical values of parallel circuit

Use Ohm's law

Calculate the value of total voltage, total current and total resistance

Calculate the voltage drop and current flow for each load

Calculate the wattage for each load and total wattage

Practice application of electrical laws – complex circuits

Define a combination circuit or complex circuit

List the rules for series and parallel circuits

Solve combination circuits using the rules of series and parallel circuits

State Kirchhoff's voltage and current law

Apply Kirchhoff's law

Quiz

Lab

Week 6

Define different types of meters

Differentiate the analog and digital meters

Discuss the operational principle of voltmeter

Connect a voltmeter to an energized circuit to measure voltage

Discuss the operational principle of ohmmeter

Connect an ohmmeter to a de-energized circuit to measure resistance

Discuss the operational principle of ammeter

Connect an ammeter to an energized load to measure current

Calibrate instruments

Record Ohm, Voltage and Amperage Readings

Connect the proper electrical instrument to measure ohm reading, voltage and amperage

List the proper sequence how to use a specific instrument to record volt,ohm,amp

Apply alternating current theory

Discuss the difference between DC and AC

Compute the instantaneous values of voltage and current for a sine wave

Compute the peak voltage, RMS, and average values of voltage and current
Discuss the phase relationship of voltage and current in a pure resistive circuit
Discuss the properties of inductance in an AC circuit: resistance, inductance, capacitance
Compute the values of inductive, reactive and inductance

Quiz

Lab

Week 7

Identify and test HVAC electrical components
Identify the high voltage and low voltage
Identify a transformer
Understand the principle and operation of the device
Use ohmmeter to measure resistance or primary and secondary taps of transformer
Use voltmeter to take reading on live circuit of a transformer
Read the primary voltage and the secondary voltage
Determine the term VA applied to a control transformer
Calculate how much amperage can a 40/60 VA transformer put out
List all electrical components in an air conditioning unit
Categorize control devices in terms of temperature, pressure, electro-mechanical, etc.
Identify a thermostat, pressure control devices, contactors, relays and overloads
Understand the principle and operation of each device
Use the proper meter to determine the condition of each component
Record ohm reading, scale of meter and list the name of the component
Compare the actual reading to the recommended reading of a specific component

Quiz

Lab

Week 8

Quiz

Lab

Review

Final examination

THE END