AC Circuits

PREREQUISITES/COREQUISITES: MAT 155 or permission of instructor.

DESCRIPTION: This course is a study of the characteristics of alternating current and voltage in resistors, capacitors and inductors, series, parallel, and complex circuits are covered. Circuits are constructed and tested.

TEXTBOOK(S) OR ALTERNATIVE: Grob's Basic Electronics; Fundamentals of DC and AC Circuits, by Schultz

MATERIALS (specifying those to be purchased by student): Materials provided are course outline and lab equipment. Students will provide textbook and workbook, paper, pencils, and a scientific calculator.

COLLATERAL READING:

CLASS MANAGEMENT ACTIVITIES (Attendance, tardies, testing, etc.):

Academic Dishonesty: Students are expected to do their own work. Please refer to the NETC Student Code and Grievance Procedure for a definition of academic dishonesty and an outline of the disciplinary action that may result therefrom.

Attendance: Students are expected to attend all scheduled classes, however, up to 20% of absence are allowed for unavoidable hardships such as illness or car trouble. A student missing more than the 20% of class for any reason will be dropped from the course for excessive absences. A grade of "W" will be assigned if a student drops a class prior to mid-term. After mid-term, a grade of "WF" is assigned unless there are extenuating circumstances and the student is passing the course at the time of withdrawal.

Tardies: A student is considered tardy if he/she arrives for class after the roll has been taken. Three tardies constitute one (1) hour of absence.

Assigned Work: If a student is absent the day an assignment (test and/or homework) is due, he is required to complete the work on the first day back in class.

Classroom Etiquette: An integral part of an education is developing a sense of integrity and responsibility not only toward ourselves but also toward others. In the classroom, as on the job or in your home, exhibiting appropriate behavior reflects on
your maturity. Arriving on time to class, being prepared, and considerate of others as they are talking has a positive effect on others. Please be considerate.

Student ID: It is mandatory that every student wear his or her student ID at all times when on the Cheraw campus. During the first week of classes, the instructor will issue a reminder to wear the ID. This reminder is a warning.

After the first week, instructors are required to dismiss students without ID from class. The student may get his/her ID (or a new one in Student Services for $3.00) and return to class before the midpoint of the class. If the student cannot get an ID and return to class by the midpoint, the instructor will record the absence.

Disabilities Statement: Students with disabilities are encouraged to contact the Dean of Student Services to discuss needs or concerns as they pursue an academic program and participate in campus life. The Dean of Student Services will provide guidance regarding official documentation of disabilities and/or accommodation of needs. (See College Catalog)

RESOURCES (A-V, persons, tools/equipment):
Audiovisuals
Lab equipment
Handouts

COURSE TOPICAL OUTLINE (List topics and sub-topics of course) and Calendar or approximate length of time devoted to topic.

The following chapters will be covered in the textbook Grob’s Basic Electronics

Chapter 13 Magnetism
The Magnetic field

Chapter 14 Electromagnetic Induction
Magnetic field around an electric current
Motor action between two magnetic fields
Induced current
Generating an induced voltage

Chapter 15 Alternating Voltage and Current
Alternating voltage generator
Voltage and current values for a sine wave
Frequency, period, and phase angle
AC circuits with resistance

Chapter 16 Capacitance
How charge is stored in the dielectric
Charging and discharging a capacitor
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The farad unit of capacitance
Parallel and series connected capacitors

Chapter 17 Capacitive Reactance
Alternating current in a capacitive
The amount of $X_C$ equals $\frac{I}{2\pi f L}$
Series or parallel capacitive reactances
Ohm’s Law applied to $X_C$

Chapter 18 Capacitive Circuits
Sine-wave $V_C$ lags $i_C$ by 90°
$X_C$ and $R$ in series
$X_C$ and $R$ in parallel
Capacitive voltage dividers

Chapter 19 Inductance
Self-inductance
Self-induced voltage
How $V_C$ opposes a change in current
Mutual inductance
Transformers
Inductances in series or parallel

Chapter 20 Inductive Reactance
How $X_L$ reduces the amount of $I$
$X_L = \frac{2\pi f L}{L}$
Series or parallel inductive reactances
Ohm’s Law applied to $X_L$

Chapter 21 Inductive Circuits
Sine-wave $i_L$ lags $V_L$ by 90°
$X_L$ and $R$ in series
Impedance $Z$ Triangle
$X_L$ and $R$ in parallel
$Q$ of a coil

Chapter 22 RC and L/R Time Constants
L/R Time Constant
High voltage produced by opening an RL circuit
RC time constant
RC charge and discharge curves

Chapter 23 Alternating Current Circuits
AC circuits with resistance but no reactance
Circuits with $X_L$ alone
Circuits with $X_C$ alone
Opposite reactances cancel
Series reactance and resistance
Parallel reactance and resistance
Series-parallel reactance and resistance
Real power
STUDENT LEARNING OUTCOMES: Upon completion of the course the student will have demonstrated the ability to:

1. Define the terms and calculate the values associated with alternating current and the sine wave.

2. Calculate, construct and measure the relationships found in series, parallel, and complex circuits using combinations of resistors, inductors and capacitors.

3. Demonstrate the proper use of test equipment, to include the oscilloscope and digital multimeters.

INSTRUCTIONAL METHODS TO COMPLETE OUTCOMES: Lectures, textbook assignments, and lab experiments.

EVALUATIVE METHODS TO APPRAISE OUTCOMES: Students will be evaluated using unit tests and lab demonstration.

70% tests
10% exams
20% lab

GRADING SCALE:

90 - 100 = A
80 - 89 = B
70 - 79 = C
60 - 69 = D
Below 60 = F