

Virginia Western Community College
ETR 113
D.C. and A.C. Circuit Fundamentals I

Prerequisites

MDE 10 (Developmental Math) -Covers topics in arithmetic through introduction to variables and equations.

Corequisites

MTH 111 (Not Intended for Transfer) -Provides a foundation in mathematics with emphasis in arithmetic, unit conversion, basic algebra, geometry, and trigonometry. This course is intended for CTE programs.

OR

MTH 167 Pre-Calc (For Transfer) Presents topics in power, polynomial, rational, exponential, and logarithmic functions, systems of equations, trigonometry, and trigonometric applications, including Law of Sines and Cosines, and an introduction to conics.

Course Description

Copy course description from College Catalog or Master Course File

Semester Credits: 4 Lecture Hours: 3 Lab Hours: 3

Required Materials**Textbook:**

Introductory Circuit Analysis, 14th Edition, Robert L. Boylestad and Brian Olivari. ISBN-13: 9780137594177

Software:

The National Instruments Multisim software is installed on school laptops for use in the classroom.

Other Required Materials:

Scientific Calculator required, must have natural entry. Examples include Casio fx-115ES PLUS, TI-36X, TI-84, TI-89(optional for EET's).

Course Outcomes

At the completion of this course, successful students will

- Explain electrical terminology and define electrical quantities including current, voltage, resistance, power, energy, efficiency, capacitance, inductance, reactance, impedance.
- Apply Ohm's Law, Kirchhoff's Voltage and Current Laws, voltage divider rule, current divider rule, Faraday's law, and Lenz's law.
- Analyze series, parallel and series-parallel circuits, both DC and AC, including an introduction to multiple-source DC circuits.
- Utilize computer software to solve basic electrical circuits.
- Define basic AC circuit characteristics like frequency, period, RMS quantities and instantaneous voltage
- Measure electrical quantities using a voltmeter and apply practical concepts.
- Use an oscilloscope to view and record AC circuit characteristics.
- Interpret the transient qualities of both inductors and capacitors.
- Demonstrate proficiency and teamwork skills in the laboratory.

Topical Description

- Chapter 1: Units, Notation, Rounding, Conversion, Significant Figures, Powers of ten, Percentages, Ratios/Proportions, Fixed Point, Floating Point, Scientific and Engineering Notation, Unit Conversion, and Block diagrams vs Schematics.
- Chapter 2: Atoms, Voltage, Current, Voltage Sources, Ammeters, Voltmeters, Insulators, Conductors and Semiconductors, Conductance, Physics of Resistance, Volts and Amps
- Chapter 3: Resistance, Resistors (Color-code), Wire tables, Temperature effects on Resistance, Conductance.
- Chapter 4: Ohm's Law, Plotting Ohm's Law, Polarity, Power, Energy, Law of Conservation of Energy, Efficiency, Circuit Breakers and GFCI.
- Chapter 5: Series Circuits, Series Resistors, Series Power, Series Voltage Sources, Kirchhoff's Voltage Law, Voltage Division, Interchanging Series Components, Grounding Connection, Internal Resistance, Loading Effects of Instruments, Breadboards and Applications.
- Chapter 6: Parallel Circuits, Parallel Resistors, Parallel Power, Kirchhoff's Current Law, Current Divider, Voltage Sources in Parallel, Voltmeter Loading, Practice Identifying Series and Parallel, Open and Short Circuits, Troubleshooting.
- Chapter 7: Series-Parallel Circuits, Block Diagram Approach, Reduce and Return Approach, Ladder Networks, Voltage Divider (Loaded and Unloaded), Impacts of Shorts and Open Circuits.
- Chapter 8: Mesh Analysis
- Chapter 9: Thevenin
- Chapter 10: Capacitance, Capacitors, Capacitors in Series and Parallel, Energy Stored in a Capacitor, Transients, and Instantaneous Voltage.

- Chapter 11: Inductance, Inductors, AC Generation, Energy Stored in an Inductor, Instantaneous Values, Inductors in Series and Parallel.
- Chapter 12: The Magnetic Field
- Chapter 13: Sine Wave, Format for Sine Voltage and Current, Phase relationship, Average and RMS values, AC meters, Applications
- Chapter 14: Response of Basic R, L, and C elements, Average Power and Power Factor, Rectangular forms of RLC elements.
- Chapter 15: Resistive, Inductive and Capacitive Elements as Impedance in a Series AC Circuit.
- Chapter 16: Total Impedance in Parallel AC Circuits.

Notes to Instructors

Beginning Fall 2020, VWCC will require students to have a computer or reliable access to a computer, capable of participation in an online format. Online courses at Virginia Western require a significant amount of interaction with Canvas, the Learning Management System, and many require real-time class sessions using the Zoom web-conferencing tool. To be successful in online classes, students must have substantial access to a computer with hi-speed internet connectivity. The expected requirements are listed on the college webpage.

Multisim software is provided on lab laptops. Multisim may allow an appended version for free student downloads

This class will incorporate NC3 multimeter certification.