Fox Valley Technical College

10660112 DC Circuits 3

Course Outcome Summary

Course Information

Description	Covers capacitors and inductors including time constants and instantaneous voltage and current values of RC and RL circuits. Applications and various types of capacitors and inductors are discussed. Magnetism, electromagnetism, and devices, such as relays and solenoids, are also presented. Laboratory activities are performed to verify the theory.
Career Cluster	Science, Technology, Engineering and Mathematics
Instructional Level	Associate Degree
Total Credits	1.00
Total Hours	27.00

Types of Instruction

Instruction Type	Credits/Hours
Lab and Lecture/Flexible	1 Credit/27 Hours

Course History

Revised By	Kaye Krueger (kruegek)
Last Approval Date	9/11/2014

Pre/Corequisites

Corequisite DC Circuits 2 (10-660-111)

Textbooks

Electronics Fundamentals: Circuits, Devices, and Applications
Floyd, Thomas L.; Buchla, David
Prentice-Hall
ISBN: 9780135072950
8th Edition

DC Circuits 1, 2, 3; AC Circuits 1, 2 - Curriculum Manual
Ken Holmes & Ben Gardner
Fox Valley Technical College
ISBN: 660110R070714

Course Competencies

1. Analyze capacitors and capacitive DC circuits.

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

1.1. Exam

Criteria

Performance will meet expectations when:

1.1. you achieve a 70% or better.

Learning Objectives

1.a. Define the following terms:
- Capacitor
- Capacitance
- Dielectric
- Dielectric Constant
- Dielectric Strength
- Farad
- Leakage Current
- Relative Permittivity
- RC Time Constant
- Working Voltage DC (WVDC)

1.b. Explain the charging and discharging process for a capacitor.

1.c. Draw the schematic symbols of the fixed and variable capacitors.

1.d. Calculate total capacitance of several capacitors connected in series and parallel.

1.e. Determine the voltage drop across each capacitor connected in series and parallel configurations when given the value of the applied power source.

1.f. List the physical factors that affect the value of a capacitor. Describe how a change in any one of these physical factors will affect the capacitance value.

1.g. Solve problems involving RC time constants to determine such values as voltage and currents when a capacitor is charged or discharged after a certain period of time or after a certain time constant.

1.h. Describe the two rules about capacitors in DC circuits.

1.i. List the general classifications of capacitors.

1.j. Identify which type of capacitor is polarity sensitive, and describe how it must be properly connected in a circuit.

1.k. Calculate the charge in coulombs stored by a capacitor when given its capacitance value and the voltage across its plates.

2. Explain the principles of the magnetic field, electromagnetism, and electromagnetic induction.

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

2.1. Exam

Criteria

Performance will meet expectations when:

2.1. you achieve a 70% or better.

Learning Objectives

2.a. Define the following terms:
- Ferromagnetic
- Flux
- Flux density
- MMF
- Permeability
- Pole
- Relative Permeability
- Reluctance

2.b. Explain motor action.
2.c. Explain the effect of magnetic pole polarity.
2.d. Apply the left hand rule to predict electromagnetic properties.
2.e. Explain how core materials can be used to strengthen magnetic fields.

3. Investigate electromagnetic devices and their applications.

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

3.1. Exam

Criteria

Performance will meet expectations when:

3.1. you achieve a 70% or better.

Learning Objectives

3.a. Define the term "holding current" in relation to solenoids and relays.
3.b. Show how you would measure the following currents in a relay circuit.
A. Coil current
B. Load current
C. Holding current
3.c. Show how you would measure continuity or resistance on the following parts of a relay circuit.
A. NO contacts
B. NC contacts
C. Coil resistance
3.d. Explain the difference between an AC and DC generator.
3.e. Explain the operation of a solenoid, reed relay, and loudspeaker.

4. Analyze inductors and inductive DC circuits.

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

4.1. Exam

Criteria

Performance will meet expectations when:

4.1. you achieve a 70% or better.

Learning Objectives

4.a. Define the following terms:
- Choke
- Counter emf (CEMF)
- Henries
- Inductance
- Inductive (Reactive) Kick
- Internal Resistance
- Permeability
- Relative Permeability
- Self-inductance
- Time Constant

4.b. Describe the physical characteristics of an inductor and how they affect inductance.
4.c. Draw the schematic diagram of an air core, ferrite iron core, and iron core inductor.
4.d. Explain the process of applying electrical energy to an inductor, the CEMF, and the conversion to magnetic energy. Explain the opposite action when electrical energy is removed.
4.e. Explain how the voltages across the inductor and resistor in a series RL circuit and the current flow changes from the instant DC power is applied to 5 time constants later. Explain the same action when electrical energy is removed.
4.f. State Lenz's Law and explain its relationship to the field of inductors/inductance.
4.g. State Faraday's Law and explain its relationship to inductance and speed in which flux lines cut a coil.
4.h. Calculate total inductance for series and parallel inductive circuits.
4.i. Calculate the voltage and current values of a series RL circuit at the various time constants.

4.j. Calculate the current in a series RL circuit a specific time after a specified voltage is applied, given the inductor and resistor values.
4.k. Calculate the current a specified time after the applied voltage is removed from an energized series RL circuit, given the inductor and resistor values and the maximum current that flows.
4.l. Describe how an ohmmeter can be used to detect a faulty inductor that has an open or a shorted condition.
4.m. Describe the operation of the circuit in the lab “Inductance in DC Circuits.”

Grant Award

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Course Learning Plans and Performance Assessment Tasks

Type	Title	Source	Status
PAT	Capacitors Exam	Course	Active
PAT	Magnetism and Electromagnetism Exam	Course	Active
PAT	Inductors Exam	Course	Active
LP	Capacitors	Course	Active
LP	Magnetism and Electromagnetism	Course	Active
LP	Inductors	Course	Active