When and where	Lecture PL 2450 2:30-3:50 M,W	Lab 002- NE 2380 M 12:55-2:25 pm NE 2380
Instructor	Prof. Wm Ted Evans, PhD, PE (Ohio)-Office: NE 1607, Phone 419-530-3349, cell 419-343-3681 Email: william.evans@utoledo.edu, web: www.eng.utoledo.edu/~wevans	
Office Hours	9:30-12:00 M, W	
Prerequisite	Prerequisites: MATH 1330 (may be taken concurrently) with a minimum grade of D- or MATH 1340 (may be taken concurrently) with a minimum grade of D-	
Textbook	Free from: www.mvcc.edu/jfiore	
Useful References	Floyd Circuits Text, Boylestadt Circuits Text, others as well	
Grading	**Quizzes 10 %, In Class Tests (3) 45 %, Home Work 5%** **Labs 20 %, Final Exam 20 %** **(A >= 90, B >= 80, C > = 70, D > = 60)**	
Class rules and regulations	1. No eating, drinking, or smoking in classrooms. 2. There are no make-up exams for this course. If you have a problem or conflict and cannot attend an exam, let me know beforehand and we will try to work something out. No credit will be given for a missed exam that we haven't made arrangements about beforehand unless you have a ***really excusable*** emergency. Cell phone use will not be allowed. If you do not have a calculator, buy one and bring it to class. Cheating is not allowed and will be punished by rules of U of Toledo Student Handbook. Read the restart text at: https://www.utoledo.edu/rocket-restart/signage/pdf/rocket-restart-manual.pdf	
Catalog descriptions	This course constitutes an introduction to electrical components, direct current circuit analysis, circuit theorems and basic electrical measurements. An introduction to sinusoidal waveforms, complex numbers, phasors and Pspice is also included.	
Topics and reading assignments (subject to change, any changes will be notified in the class beforehand)	Will follow 14 week schedule outlined in Fiore website for ET 151 – Circuits 1 found on website above.	
Class dates (Exam dates are subject to change.)	Fall Session 2021 –	

I. CATALOG DESCRIPTION:

ET151 CIRCUITS I C 3, P 2, CR 4

The fundamentals of DC circuit analysis are introduced. This includes the definition of various electrical quantities and their relationships. Topics include series and parallel circuits, Kirchhoff's Laws, Thevenin's Theorem, Norton, superpositioning, maximum power transfer and nodal and mesh analysis. Proper usage of laboratory equipment is stressed.

Corequisites: ET153 Introduction to Electronics and MA121 Fundamentals of College Mathematics (or alternate math courses MA122, MA125, MA150 or MA151).

II. MATERIALS:

Text: DC Electrical Circuit Analysis: A Practical Approach, James M. Fiore, a free OER text: PDF ODT HTML PRINT
Tools: A scientific calculator with trig, exponential and polar to rectangular functions, preferably with simultaneous equation solution capability; small hand tools such as a wire stripper, small screwdriver, long nose pliers, and an electronic breadboard.

Laboratory Manual for DC Electrical Circuit Analysis, James M. Fiore,
(OER): PDF ODT HTML PRINT

Video: See the DC Electrical Circuit Analysis playlist on my YouTube channel: ElectronicsWithProfessorFiore

III. STUDENT LEARNING OUTCOMES:

The student will demonstrate a firm understanding of the behavior of DC electrical circuits.

The student will demonstrate analytical skills and insights that will be expanded and applied to more advanced circuits encountered in later courses.

The student will use a mathematical and problem solving approach for introductory circuit analysis, based on fundamental DC circuit principles and math concepts. This will include the use of computer simulations.

The student will demonstrate facility at constructing and trouble shooting basic DC circuits in the laboratory with proper use of test equipment.

The student will demonstrate the command of appropriate communication skills, particularly technical reports through the laboratory.

The student will demonstrate the ability to work as part of a technical team, particularly in the laboratory.

Course Assessment Standards

Background

Success in this course requires a good working knowledge of algebra. This is an introductory course, and as such, it assumes that you know very little about electricity. No previous course work in electricity or electronics is required. Basic electrical concepts such as voltage, current, power, and resistance are introduced and examined for DC (direct current). Fundamental laws and relationships such as Ohm's Law and Power Law are developed. Analysis techniques include series-parallel simplification, Thevenin's, Norton's, and Superposition Theorem, and Mesh and Nodal Analysis. This is one of the most important courses you will take in the electrical sequence because it creates the foundation for all of the others. **It is virtually impossible to be successful in this program without mastery of the material presented in this course. Treat it appropriately.** A good scientific calculator with simultaneous equation solution capability will be of great use and is strongly recommended. Further, smart devices will not be allowed during tests. For lab, you'll need the standard array of goodies as used throughout this program (breadboard, DMM, small handtools, hook-up leads, etc.) Unless otherwise specified, all lab exercises require a technical report due no later than one week after the exercise. Late penalty is one letter grade for the first half week, two letter grades for the second half week. Reports are not accepted beyond two weeks and receive a grade of 0. Remember, plagiarism is grounds for failure.

Check out my free books page for free circuit simulators and other OER (Open Educational Resources).

Week-by-week progress and assignments.

1	An introduction to units, conversions, and measurement schemes. This is very important background material. Chapter 2 then introduces some basic electrical quantities and properties. • **Reading:** Chapter 1. • **Problems:** Chapter 1: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25. • **Video:** Introduction, Scientific Notation, and Electrical Fundamental Part 1 from the DC Electrical Circuit Analysis playlist. • **Lab:** We start the semester with proper lab safety procedures, then we'll review mathematical operations and scientific calculator procedures. The first lab is *The Electrical Laboratory*
2	This week we define basic quantities such as current, energy, voltage and power. We also examine basic interrelationships such as Ohm's law and power law. • **Reading:** Start chapter 2. • **Problems:** Chapter 2: 1, 3, 5, 7, 9, 11, 13, 15, 19, 21, 27, 29, 55. • **Video:** Electrical Fundamental Part 2 and Sources, Grounds & Battery Life from the DC Electrical Circuit Analysis playlist.

	• **Lab:** *DC Sources and Metering*
3	We introduce concepts such as efficiency and continue with the interrelationships. We also examine resistance, conductance and laboratory instrumentation. • **Reading:** Finish chapter 2. • **Problems:** Chapter 2: 25, 31, 33, 37, 39, 41, 45, 49, 51, 53, 59. Try the Intro Self Test • **Video:** Resistance and Conductance, Resistor Color Code from the DC Electrical Circuit Analysis playlist. • **Lab:** *Resistor Color Code*
4	We finish energy and power calculations by mid-week. We then launch in on chapter 3, which covers series circuits. Make sure that you at least read over the first few chapter sections before reading the lab exercise. • **Reading:** Start on chapter 3. • **Problems:** Chapter 3: 1, 3, 5, 7, 9, 11. • **Video:** Ohm's Law, Series Circuits Parts 1 and 2 from the DC Electrical Circuit Analysis playlist. • **Lab:** *Ohm's Law*
5	This week we start putting a few things together and form the simplest sort of circuits: series circuits. Around here we will have our first test. We also begin an examination of parallel circuits. • **Reading:** Complete chapter 3 and start chapter 4. • **Problems:** Chapter 3: 13, 15, 19, 21, 23, 25, 29, 31, 35, 37, 39, 43, 49, 59. Chapter 4: 1, 5, 7, 9. • **Video:** Voltage Divider Rule, Parallel Resistors, Parallel Circuits Part 1 from the DC Electrical Circuit Analysis playlist. • **Lab:** *Series DC Circuits*
6	We continue with parallel circuits and by week's end, we introduce the combination series-parallel circuit in its most basic forms. There are an infinite variety of series-parallel circuits. Do *not* attempt to memorize pat solution forms. Doing so will only get you into trouble later. • **Reading:** Complete chapter 4 and start chapter 5. • **Problems:** Chapter 4: 11, 15, 17, 19, 27, 29, 31, 35, 37. Chapter 5: 1, 5, 13. • **Video:** Parallel Circuits Part 2, Series-Parallel Circuits Part 1 from the DC Electrical Circuit Analysis playlist. • **Lab:** *Parallel DC Circuits*

7	We finish our work with basic series-parallel circuits (although we are by no means done with the topic-there are numerous circuits that will require the more sophisticated techniques presented shortly). • **Reading:** Finish chapter 5. • **Problems:** Chapter 5: 17, 19, 25, 29, 39, 41, 45, 47, 53, 61, 67, 76, 78. Try the first couple of problems on the series-parallel worksheet. • **Video:** Series-Parallel Circuits Part 2 from the DC Electrical Circuit Analysis playlist. • **Lab:** *Seies-Parallel DC Circuits*
8	The next three or so weeks will involve examination of various theorems and solution techniques. If you haven't already done so, make sure that you read through your calculator's manual and learn how to perform simultaneous equation solutions. We begin our work with current source conversions and lead directly into theorems, including Thevenin's theorem and superposition theorem. Note that superposition *requires* that the circuit be linear, thus non-linear circuits (such as those that exhibit saturation or rectification) cannot be solved using superposition. This is often forgotten by the beginning student. • **Reading:** Begin chapter 6. • **Problems:** Chapter 6: 1, 3, 5, 9, 10, 11, 13, 15, 17, 23, 39, 45, 49. Try the final couple of problems (Superposition) on the series-parallel worksheet. • **Video:** Source Conversions Parts 1 & 2, Superposition from the DC Electrical Circuit Analysis playlist. • **Lab:** *Ladders and Bridges*
9	Norton's theorem and maximum power transfer theorem round out our discussion of theorems. At week's end we introduce mesh and nodal analysis from chapter 7. We will start with nodal analysis. • **Reading:** Finish chapter 6 and begin chapter 7. Read the notes on simultaneous equations. • **Problems:** Chapter 6: 51, 53, 55, 57, 59, 61, 66, 69, 77. Try the Series-Parallel and More Self Test. Try the nodal problems on the Mesh-Nodal Worksheet. • **Video:** Thevenin's Theorem, Maximum Power Transfer Theorem, Nodal Analysis from the DC Electrical Circuit Analysis playlist. • **Lab:** *Potentiometers and Rheostats*
10	In chapter 7, we work through nodal analysis and mesh analysis, first using the general approach and secondarily using the format approach. Some people prefer nodal over mesh. Some people prefer mesh over nodal. Either one can be used to solve a given circuit, however, you may find that the solution of a given circuit is easier or faster using one technique in favor of the other. Time and practice will bear this out. Around here we will have our second test.

	• **Reading:** Finish chapter 7. • **Problems:** Section 7: (nodal) 46, 47, 51, 55, 56, 58, 61, 67, 81, (mesh) 1, 3, 9, 13, 17, 21, 23, 25, 29, 43. Try the mesh problems from the Mesh-Nodal Worksheet. Before the in-class test, make sure you try this Superposition, Nodal, Thevenin Self Test. • **Video:** Mesh Analysis from the DC Electrical Circuit Analysis playlist. • **Lab:** *Superposition Theorem*
11	We finish any remaining details on network analysis and theorems, including dependent sources. Once we finish up, we launch into a discussion of reactive components, beginning with capacitors. • **Reading:** Begin chapter 8. • **Problems:** Chapter 7: 73, 75, 77, 79, 91. Chapter 8: 1, 2, 3, 4. • **Video:** Dependent Sources from the DC Electrical Circuit Analysis playlist. • **Lab:** *Thevenin's Theorem*
12	We continue with capacitance and at week's end, introduce transient response. • **Reading:** Complete chapter 8. Read part I of Capacitors As Buckets for an analogy of how capacitors charge. • **Problems:** Chapter 8: 7, 9, 11, 13, 15, 19. • **Video:** Intro to Capacitors, RC Circuits Parts 1 & 2 from the DC Electrical Circuit Analysis playlist. • **Lab:** *Maximum Power Transfer*
13	The discussion of RC circuits concludes this week and we introduce inductors. • **Reading:** Start chapter 9. • **Problems:** Chapter 8: 21, 25, 26. Chapter 9: 1, 3, 5, 7, 11, 15. • **Video:** Intro to Inductors from the DC Electrical Circuit Analysis playlist. • **Lab:** *Nodal Analysis*
14	RL circuits concludes our discussion for the semester. Time permitting, we have our last in-class test. **Reading:** Finish chapter 9. • **Problems:** Chapter 9: 17, 19, 23, 25, 27, 29, 31. • **Video:** RL Circuits Parts 1 & 2 from the DC Electrical Circuit Analysis playlist. • **Lab:** *Capacitors and Inductors*