CRN# 21172 CPET 101-01 Electrical Circuits
CRN# 22851 ECET 102-01 Electrical Circuits I
Spring 2012

Course Description
CPET 101/ECET 102 (4 Cr., Class 3, Lab 2): A study of DC electrical circuits, Ohm's Law, Kirchhoff's Laws, series and parallel circuits, power, magnetism, ammeters, voltmeters, ohmmeters, inductance, capacitance, and an introduction to alternating voltages, currents and reactances.
Preparation for Course: C: MA 15300.

Instructor Information
Paul I-Hai Lin, Professor of Electrical and Computer Engineering Technology
Department of Computer, Electrical, and Information Technology
College of Engineering, Technology, and Computer Science
Indiana University-Purdue University Fort Wayne
2101 Coliseum Blvd E, Fort Wayne, IN 46805
Office: ET 205C   Phone: 260-481-6339   Email: lin@ipfw.edu
Office Hours:
* Monday   2:00 - 4:00 PM
* Monday   6:00 - 7:00 PM
* Tuesday   2:30 - 5:30 PM
* Wednesday   2:00 - 4:00 PM
* Other weekday hours – by appointment

Lecture: Room ET 131 Monday & Wednesday   4:30-5:45PM
Lab: Room ET 305 Monday   7:30-9:30PM
Course Web site: http://www.etcs.ipfw.edu/~lin

Required Text:
Robert L. Boylestad, *Introductory Circuit Analysis*, 12th edition, Pearson Education, ISBN 9780-1371-46666, 2010.

Course Outcomes
Upon successful completion of this course, a student will have demonstrated the ability to:

1) Understand the operation of power supplies and modern electronic meters and equipment
2) Be familiar with the concepts of voltage and current.
3) Be familiar with the concepts of resistance.
4) Be familiar with Ohm's law, power, and energy, and applications.
5) Be able to analyze DC series, parallel, and series-parallel circuits.
6) Understand Kirchoff's voltage and current laws, and their applications.
7) Be able to use Thevenen's and Norton's theorems for electrical circuits.
8) Be able to use superposition, mesh, and nodal methods for circuit analysis.
9) Be able to use computer analysis tools including MATLAB, Multisim, and PSpice

Disabilities Statement: If you have a disability and need assistance, special arrangements can be made to accommodate most needs. Contact the Director of Services for Students with Disabilities (Walb, room 113, telephone number 481-6658), as soon as possible to work out the details. Once the Director has provided you with a letter attesting to your needs for modification, bring the letter to me. For more information, please visit the web site for SSD at http://new.ipfw.edu/disabilities/

Course Assessment and Grading policy

- Homework assignments – 15%
- Three Tests – 45%
- Lab and Reports – 20%
- Final Exam (comprehensive) – 20%

Grading Scale: A (90-100%), B (80 -89%), C (70-79%), D (60-69%), F (0-59%)
*No late assignment, report, etc., will be accepted
*No makeup quiz will be given.

Important Dates
- March 6, no class, Spring break March 5-11
- March 16, Last day to withdraw
- April 24 and May 1 (6:00 PM-8:45PM), Final Project Demo and Presentation

Tentative Topics of Discussion

Date	Chapter
Jan 9,11	**Ch. 1 Introduction**

- The Electrical/Electronics Industry
- Electrical Power Generation Systems
- A Brief History
- The Solid-State Era
- Nano Technology
- Renewable Energy (Wind, Solar, Fuel Cell, etc)
- Units of Measurement
- Systems of Units
- Significant Figures, Accuracy, and Rounding off
- Power of Ten
- Fixed-point, Floating-point, Scientific and Engineering Notation
- Units Conversions
- Computer Analysis and Design: MATLAB, PSpice, Multisim

Jan 16*,18	**Ch. 2 Voltage and Current**
Jan 23, 24	
Jan. 30	

- Introduction
- Atoms and Their Structure
- Voltage
- Current
- Safety Considerations
- Voltage Sources
- Solar Cells

- Generators
- Power Supplies
- Fuel Cells
- Ampere-Hour Rating
- Battery Life Factors
- Conductors and Insulators
- Semiconductors
- Ammeters and Voltmeters
- Applications
- Car Battery Charger
- Automobile Applications: Electric Vehicles, Hybrid and Plug-In Hybrid
- Computer Analysis and Design: MATLAB, PSpice, Multisim

Feb 1   **TEST #1 (ch. 1,2)**

Date   **Chapter**

Feb 6,8   **Ch. 3 Resistance**
Feb 13, 15

- Introduction
- Resistance: Circular Wires
- Wire Tables
- Temperature Effects
- Temperature Coefficient of Resistance
- Types of Resistors: Fixed resistors, Variable resistors, Color coding and standard Resistor values
- Surface Mount Resistors
- Conductance
- Ohmmeters
- Resistance: Metric Units
- The Fourth Element: Memoresistor
- Superconductors
- Themistors
- Photoconductive Cell
- Varistors
- Applications: Electric Basedboard Heating Element, Dimmer Control in an Automobile
- Strain Gauges
- Computer Analysis and Design: MATLAB, PSpice, Multisim

Date   **Chapter**
Feb 20,22   **Ch. 4 Ohm's Laws, Power, and Energy**
Feb 27, 29

- Introduction
- Ohm's Law
- Plotting Ohm's Law
- Power
- Energy
- Energy Efficiency
- Circuit Breakers, GFCI (Ground Fault Circuit Interrupter)
- Applications:

- Fluorescent vs. Incandescent
- Microwave Oven
- Household Wiring
    - Computer Analysis and Design: MATLAB, PSpice, Multisim

    TEST #2 (ch. 3,4)

Mar 5*, 7*   (Spring Break)

Date   **Chapter**
Mar 12,14   **Ch. 5 Series DC Circuits**
- Introduction
- Series Resistors
- Instrumentation
- Series Circuit
- Power Distribution in a Series Circuit
- Voltage Sources in Series
- Instrumentation
- Kirchhoffs's Voltage Law
- Voltage Division in a Series Circuit
- Voltage Divider Rule
- Interchanging Series Elements
- Notation
    - Voltage Sources and Ground
    - Double-Subscript Notation
    - Single-Subscript Notation
- Voltage Regulation and the Internal Resistance of Voltage Sources
- Loading Effects of Instruments
- Protoboards (Breadboards)
- Applications
    - Series Control
    - Holiday Lights
    - Microwave Oven
- Computer Analysis and Design: MATLAB, PSpice, Multisim

Date   **Chapter**
Mar 19,21   **Ch. 6 Series DC Circuits**
- Parallel Resistors
- Parallel Circuits
- Power Distribution in a Parallel Circuit
- Kirchhoff's Current Law
- Current Divider Rule
- Voltage Sources in Parallel
- Open and Short Circuits
- Voltmeter Loading Effects
- Troubleshooting Techniques
- Protoboards (Breadboards)
- Applications
    - Car System
    - House Wiring

- Parallel Computer Bus Connections
  - Computer Analysis and Design: MATLAB, PSpice, Multisim

Date	Chapter
Mar 26,28	**Ch. 7 Series-Parallel Circuits**

  - Series-Parallel Networks
  - Reduce and Return Calculation Approach
  - Block Diagram Approach
  - Descriptive Examples
  - Ladder Networks
  - Voltage Divider Supply
    - No-Load Conditions
    - Loaded Conditions
  - Potentiometer Loading
  - Ammeter, Volmeter, and Ohmmeter Design
  - Applications
    - Boosting a Car Battery
    - Electronic Circuits
  - Computer Analysis and Design: MATLAB, PSpice, Multisim

Apr 2   **TEST #3 (ch. 5,6,7)**

Date	Chapter
Apr 2, 4	**Ch. 8 Methods of Analysis and Selected Topics**
Apr 9, 11	

  - Current Sources
  - Source Conversions
  - Current Sources in Parallel
  - Branch-Current Analysis
  - Mesh Analysis
  - Nodal Analysis
  - Bridge Network
  - Applications
    - Constant-Current Alarm Systems
    - Wheatstone Bridge Smoke Detector
  - Computer Analysis and Design: MATLAB, PSpice, Multisim

Apr 16, 18   **Ch. 9 Network Theorems**
Apr 23, 25

  - Superposition Theorem
  - Thevenis's Theorem
    - Experimental Procedures
  - Norton's Theorem
    - Experimental Procedures
  - Maximum Power Transfer Theorem
  - Millman's Theorem
  - Computer Analysis and Design: MATLAB, PSpice, Multisim

May 2 (4:00-6:00 PM)   **FINAL Exam**

Lab Schedule

Lab

#1	Test Equipment (Digital Multimeter, Battery and Power Supply)
#2	Color Coded Resistor
#3	Ohm's Law Lab
#4	First Computer Lab
#5	Series Circuits
#6	Second Computer Lab
#7	Parallel Circuits
#8	Third Computer Lab
#9	Series-Parallel Circuits
#10	Fourth Computer Lab
#11	Superposition and Source Conversion
#12	Thevenin's Theorem
#13	Fifth Computer Lab
#14	Maximum Power Transfer