1. **ECE 2100 Circuit Analysis**  
   (version 23 March 2016)

2. Credit Hours: (4)  
   Contact Hours: (6)

3. Damon A. Miller, Ph.D., Associate Professor

   a. Access to *Mastering Engineering*™ online homework system  
   b. J. Kelemen, D. A. Miller, F. L. Severance, et al., *ECE 2100 Laboratory Manual*, available online at no cost  

5. Specific course information (from WMU catalog)  
   b. Prerequisites: Prerequisites: PHYS 2070 (or taken concurrently) and MATH 1230 or 1710; with a grade of “C” or better in all prerequisites.  
   c. Required course.

6. Specific goals for the course  
   a. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.  
   **ABET student learning outcomes assigned to this course: c and d.**

This course develops  
1. an understanding of electric charge, current, voltage, energy, and power (a)  
2. an ability to analyze linear DC circuits using Ohm’s Law, Kirchhoff’s voltage law (mesh analysis), and Kirchhoff’s current law (nodal analysis) (a, e);  
3. an ability to utilize network analysis techniques including superposition, source transformations, and Thevenin and Norton’s theorems (a, e);  
4. an ability to design simple DC voltmeters and ammeters using d’Arsonval movement meters (c, e);  
5. an ability to analyze and design electronic circuits that utilize operational amplifiers (a, c, e);  
6. an understanding of the terminal characteristics of capacitors and inductors (a);  
7. an ability to analyze steady state linear AC circuits containing dependent and independent sources, resistors, capacitors, and inductors (a, e);  
8. an ability to perform DC and AC power calculations including power factor correction (a, c, e);  
9. an ability to represent the total system response as a sum of a transient and steady state response and a natural and forced response (a, e);  
10. an ability to determine the step response of first and second order linear circuits (a, e);
11. an ability to analyze and experimentally validate DC and AC circuits (b, e, k);
12. an ability to use electronic test instrumentation such as voltmeters, ammeters, ohmmeters, signal generators, oscilloscopes, and wattmeters (b, k);
13. an ability to prepare effective written technical communications for engineering analysis work (g);
14. an ability to thoroughly and accurately document laboratory work using a laboratory notebook (g);
15. an ability to function as an effective engineering team member (d); and
16. a recognition of the need for life-long learning (i).

7. Brief list of topics to be covered

**LECTURE**
1. Electrical units, quantities, elements
2. Circuit topology
3. Basic circuit laws: Ohm’s Law, Kirchhoff’s Laws, voltage and current division
4. Nodal and mesh analysis
5. Circuit theorems: linearity, superposition, source transformation, Thevenin’s and Norton’s Theorems, maximum power transfer
6. Operational amplifiers
7. Capacitance and inductance
8. Sinusoids and phasors
9. Sinusoidal steady state analysis
10. AC circuit power
11. RC, RL, and RLC circuits: transient and steady state response and forced and natural response to step input

**LABORATORY**
1. Basic Circuit Measurements and Ohm’s Law (includes laboratory safety quiz)
2. Series and Parallel Circuits
3. Basic DC Meter Design
4. Nodal and Mesh Analysis: Comparison of Analysis, Experimental, and Simulated (SPICE) Results
5. Superposition and Thevenin’s Theorem
6. Basic Waveforms and Oscilloscope Operation
7. Operational Amplifier Circuits
8. Steady-State AC Behavior of Passive Circuit Elements
9. Frequency and Intuitive Step Response of RC Filters
10. AC Power and Power Factor Correction
11. Step Response of an RC Circuit
12. Step Response of an RLC Circuit