EEE 211 Analog Electronics
Learning Objectives

1. Student should be able to recognize/identify and analyze idealized passive linear circuits (containing R,L,C) undergoing sinusoidal excitation:
   a. Apply KCL, KVL, write down node equations for a given circuit correctly using phasor notation;
   b. Apply superposition, whenever necessary, correctly;
   c. Solve circuit equations correctly;
   d. Numerically determine circuit variables, voltage and/or current amplitude, frequency, phase accurately up to the required precision, in specified notation (scientific or engineering);

2. Student should be able to design idealized passive linear circuits under sinusoidal excitation:
   a. Determine the type and/or value of an element of a circuit for a specified circuit performance (like transfer function, cut off frequency, etc.)

3. Student should be able to analyze and design idealized active linear circuits containing OPAMPs (with behavioral outcomes as specified in items 1 and 2 above)

4. Student should understand that an ideal model for a component is very useful to model real components, and any experience with real components can be predicted through a model based analysis:
   a. Student should understand that real components have extra elements which represent the behavior deviating from ideal in their model in addition to the ideal model;
   b. Student should be able to model measured characteristics of a component using combinations of ideal element models;

5. Student should develop the habit of thinking about circuits in a (mathematical) model based manner:
   a. Draw the circuit diagram for any combination of elements correctly;
   b. Apply the systematic analysis methods, as described in item 1 above, to calculate the functionality of the circuit, like always starting up the analysis by writing down the circuit equations for the interconnections correctly;

6. Student should be able to read circuit diagrams of intermediate complexity;
   a. Understand the commonly used component symbols;
   b. Recognize OPAMP circuits, filters and other building blocks;
   c. Deduce function from the combination of building blocks;

7. Student should understand that every experimental outcome/observation, however unexpected it may be, can be understood, explained and predicted by means of developing an appropriate model for the experimental set up:
   a. Student should try to understand and model how the measuring instrument can modify the circuit;
   b. Student should try to numerically calculate the modification effects

8. Student should consolidate the previous knowledge and skills in physics and mathematics, and the newly acquired ones in electronics, at each phase, to reach to a higher competence level in electronic circuits:
    a. Student should demonstrate that she/he understands that finishing up a piece of work is the most fundamental engineering skill;
    b. Student should demonstrate that she/he can finish up a piece of work in most cases with her/his existing knowledge, although there may be missing/lacking knowledge and/or skill elements at that instant;
    c. Student should understand that what is experienced in item 8.b. is the best opportunity to realize the deficiencies, review and learn the missing knowledge immediately, and consolidate with the existing Knowledge and skills.

9. Student should understand that very good knowledge and skills in applied mathematics is fundamental in electronics engineering:
    a. The student should use complex algebra fast and correctly for analysis of linear circuits undergoing sinusoidal excitation;
    b. The student should use calculators in a careful, knowledgeable and quick manner for obtaining results in analysis and design;
    c. The student should understand that this course is a most basic course in electronics and circuit theory, and advanced topics in this field require competencies in other fields of applied mathematics such as calculus, differential equations, linear algebra, complex calculus and theory of probability, as a minimum.

A contemporary (and somewhat controversial) politician, D. H. Rumsfeld, said:

"As we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns -- the ones we don't know we don't know."

Learning engineering is all about minimizing the last class, while working on the second in order to increase and consolidate the first class.