EE 301 - Circuit Analysis I

Catalog Data

EE 301-4. Circuit Analysis I. Basic circuit elements and voltage-current relationships, circuit analysis and design techniques and concepts, energy storage elements, first and second order circuits, Op-Amp circuits, sinusoidal steady state analysis. Prerequisites: MTH 233, PHY 242; corequisite or postrequisite: EE 302.

Textbook

Nilsson, *Electric Circuits,* 7th Edition, Prentice Hall.

Coordinator

F. D. Garber, Associate Professor of Electrical Engineering

Topical Prerequisites

Each student should:

- be able to apply Ohm's law
- know the fundamental laws of electricity and magnetism
- understand voltage and current concepts
- be familiar with linear differential equation techniques

Learning Objectives

For each student to:

- be able to apply Kirchhoff's laws to DC circuits
- understand Thevenin and Norton's theorems
- be able to analyze 1st order and 2nd order circuits subject to constant sources
- be exposed to sinusoidal steady state analysis
- be able to design some basic circuits including an independent current source, a summer, etc.
- be able to apply linear differential equation techniques to the formulation and solution of problems involving electric circuits

Laboratory

Circuit Analysis I Laboratory, EE 302, is intended to complement this lecture course.

Computer Usage

Each student is required to master Spice software, which is available on college PCs.

Estimated ABET Category Content	Engineering Science	3.5 credit hours or 87.5%
	Engineering Design	.5 credit hours or 12.5%

Program Outcomes													
a1	**a2**	**a3**	**b1**	**b2**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
3	1	2			2		2	1	1		2	1	1

EE 302 - Circuit Analysis I Laboratory

Catalog Data

EE 302-1. Circuit Analysis I Laboratory. Circuit analysis and design techniques, computer assisted analysis, RLC circuits operational amplifiers and circuits, Thevenin and Norton equivalents, maximum power transfer, AC networks. Pre-requisite or corequisite: EE 301.

Textbook

EE 302 Laboratory Experiments (EE Department Staff)

Coordinator

F. D. Garber, Associate Professor of Electrical Engineering

Topical Prerequisites

Each student should
- know the basic principles of electricity and magnetism

Learning Objectives

Each student should be able to
- operate basic equipment such as an oscilloscope, function generator, power supply and multimeter
- design and implement elementary resistive, first order and second order circuits.

Laboratory Projects

Each student should be able to complete the laboratory project in
- operating the laboratory equipment
- investigating the validity of the voltage division law, current division law and Kirchoff's voltage and current laws
- developing an understanding of the SPICE software package through specified circuit analysis and design experiment
- investigating and verifying Thevenin's theorem and the principle of superposition
- designing a circuit using operational amplifiers
- investigating the step response of an RL and an RC circuit. Compare to theoretical predictions.
- investigating the step response of second order RLC circuits. Compare to theoretical predictions.

Laboratory Equipment

Oscilloscope, power supply, signal generator, digital multimeter, resistor, capacitor and inductor decade boxes

Computer Usage

Each student is required to master SPICE, which is used by students in analyzing circuits in labs 3 through 8 above.

Estimated ABET Category Content

Engineering Science .5 credit hours or 50%
Engineering Design .5 credit hours or 50%

Program Outcomes													
a1	**a2**	**a3**	**b1**	**b2**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
3	1	2			2		2	1	1		2	1	1

EE 303 - Circuit Analysis II

Catalog Data

EE 303-3. Circuit Analysis II. Sinusoidal steady-state analysis, alternating current concepts, RLC circuit analysis and design, power calculations, mutual inductance and transformers, three-phase circuits, analysis and design of frequency-selective circuits and RLC filters. Prerequisites: EE 301 and EE 302; Corequisite or postrequisite: EE 304.

Textbook

Nilsson, *Electric Circuits*, 7th Edition, Pearson Prentice Hall, 2005.

Coordinator

A. K. Shaw, Professor of Electrical Engineering

Goals

This second circuits course is designed to provide each student with concepts and tools needed to understand alternating current, power and more advanced circuit analysis and design. This course is designed to be taken proceeding or at the same time as the associated laboratory, EE 304 (1).

Topical Prerequisites

Each student should

- be able to apply Kirchhoff's voltage and current laws to the analysis of DC circuits
- be able to apply circuit analysis techniques to DC circuits to include: node voltage method, mesh current method, source transformations, Thevenin and Norton equivalents, maximum power transfer and superposition
- be able to analyze circuits containing passive energy storage elements
- be able to analyze the response of first and second order circuits
- be familiar with sinusoidal steady state analysis

Learning Objectives

For each student to

- be able to perform sinusoidal steady state circuit analysis using
  linearity, superposition, Thevenin and Norton equivalents, Kirchhoff's laws in the frequency domain, node-voltage and mesh-current methods
- be able to perform sinusoidal steady state power calculations including
  instantaneous and average power, RMS values, reactive power (inductive and capacitive), power factor improvement and circuit design for maximum power transfer
- be able to analyze three-phase circuits including
  three-phase voltage and current, analysis of Wye-Wye and Wye-Delta circuits and power calculations
- understand mutual inductance and transformers including
  self and mutual inductance, linear transformers, ideal transformers and analysis and design of circuits containing linear ideal transfers
- understand frequency selective circuits including
  frequency response, RLC lowpass, highpass and bandpass filter design

Laboratory

EE 304, Circuit Analysis II laboratory is the laboratory component of EE 303

Computer Usage

EE 304: each student uses B² Spice software in analyzing and designing circuits.

Estimated ABET Category Content

Engineering Science 2.5 credit hours or 83.3%
Engineering Design .5 credit hours or 16.7%

Program Outcomes													
a1	**a2**	**a3**	**b1**	**b2**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
3	1	2			2		2	1	1		2	1	1