Department of Electrical Engineering and Computer Science
The University of Kansas

EECS 211- Circuits I **Fall, 2009**

Catalog Data: EECS 211 Circuits I (3). Analysis of linear electrical circuits: Kirchhoff's laws; source, resistor, capacitor and inductor models; nodal and mesh analysis; network theorems; transient analysis; Laplace transform analysis; steady-state sinusoidal analysis; computer-aided analysis.
Co-requisites: Math 220 (Differential Equations) Math 290 (Linear Algebra)

Textbook: **Basic Engineering Circuit Analysis,** 9th edition by J. David Irwin, J. Wiley & Sons, 2008

Pspice For Basic Circuit Analysis, 2nd edition by Joseph Tront, McGraw Hill, 2007

Software: **OrCad Capture CIS** (which runs Pspice) is available on EECS network computers under the program heading "Cadence PSD" A limited, Windows™ version of this software is included in the Pspice text.

Course Objectives:

This course is designed to give sophomores in electrical and computer engineering the basic tools and techniques for analyzing linear electrical circuits and to develop student proficiency in the use of these tools and techniques.

Prerequisites by Topics:

1. Differential and integral calculus.
2. Concurrent study of simultaneous linear algebraic equations.
3. Concurrent study of differential equations, including solution by Laplace transforms.
4. Sufficient computer familiarity to be able to use the PSpice computer-aided circuit analysis package.

ABET Outcomes: Students should be capable of:

1. Applying the basic definitions and identities for voltage, current, charge, power and energy.
2. Writing proper Kirchhoff's equations for any circuit in both the time- and frequency domains (Laplace transform domain *and* phasor domain).
3. Writing proper Kirchhoff's equations in terms of the basic time-domain and frequency-domain (Laplace transform domain *and* phasor domain) current-voltage relations for linear resistors, capacitors, inductors, and both dependent and independent voltage and current sources.
4. Solving sets of 2 or 3 simultaneous linear circuit equations using matrix or determinants methods.
5. Applying the following circuit theorems and techniques: Thevenin and Norton equivalences, superposition, and ideal op-amp method.

Computer Usage: PSpice dc, ac, and transient simulations of simple electric circuits.

Laboratory Projects: None

Estimated Content:

Engineering Science : 2.7 hours (90%)
Engineering Design : 0.3 hours (10%)

Instructor: Kenneth R. Demarest

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Office Hours: 8:30 - 9:30 MW (Eaton)
11:00-11:30 MWF (Eaton)
3:00 - 4:00 F (Eaton)
T,R (325 Nichols Hall, by appointment)

Course Topics:

1. Basic electrical variables, elements, and relationships (2)
2. Analysis of simple networks (3)
3. Nodal and mesh analysis (3)
4. Operational amplifiers (2)
5. Network theorems: linearity, superposition, source transforms, Thevenin/Norton equivalents, maximum power transfer (3)
6. Capacitors and inductors (2)
7. Sinusoidal steady-state analysis (4)
8. First-order transient analysis: natural, forced, pulse responses (5)
9. Laplace transform circuit analysis (4)
10. Hour exams (2) (Tentative dates: Exam I: F Oct 2, Exam II: W Nov 18-M Nov 23)
11. Final Exam (Tuesday, December 15, 10:30 a.m.-1:00 p.m)

Grading: The following percentages will be used to arrive at the final grade scores

Exam I 25
Exam II 25
Final Exam 30
Homework 20

Final letter grades are determined from the final grade scores using a scale similar to the traditional 90-100 A, 80-90 B, etc..., but can vary from semester to semester. In borderline cases, the instructor reserves the right to consider intangibles such as exceptional homework performance or one bad exam to augment a student's raw score up to 2 points. **A passing grade must be earned in each of the grade categories (exams and homework) to earn a passing grade for the course**. Changes announced in class supersede these written instructions.

Homework: Homework will be collected at the beginning of class on a weekly basis. Late homework is not accepted, except for unusual circumstances. Collaboration with classmates is permitted. Copying is *not* permitted and will dealt with by the Associate Dean of Engineering.

Exams: I will announce before each exam whether it will be closed book, closed book with "cheat sheet", or open book.

Make-ups: Make-up exams are given rarely, and only if: 1) I am informed IN ADVANCE, and 2) I deem the reason to be sufficiently meritorious (job interviews and pleasure trips are not). If the reason is illness, I REQUIRE documentation of the illness from a health-care professional. I do not consider a cold to be an illness.

Class decorum: The School of Engineering is a professional school, and this class will reflect that. You are expected to arrive on time, leave on time, and act professionally in class. This includes being intellectually and physically involved in the class. Computers and cell phones are not to be used in class.

Special Needs: Any student who has a disability that demands special accommodations should contact the instructor personally in order to make arrangements. Also, members of KU sanctioned organizations (band, athletic teams, etc.) that have special needs should also contact the instructor as the need arises.

Academic Misconduct: Instances of cheating may result in expulsion from class and referral to the Dean. Cheating includes, but is not limited to: copying another exam paper, copying another homework paper, copying from solution manuals or previous students' homework papers, having another student do your work, etc.