Course Overview

• EE 105 – new version
  – Prerequisite: EECS 40
  – analog integrated circuits + basic IC device models needed to design them
  – course incorporates a laboratory

• Related courses:
  – EE 130, 140, 141, 142

Basic Course Information

• Lab reader available in Copy Central by 1/24
• Labs start on 1/28.
• 1st midterm on Wedn 3/5/02 6-7:30pm
• 2nd midterm on Wedn 4/16/02 6-7:30pm
• Final exam on Sat 5/17/02 8-11am.
• Homeworks out each Wedn, due following Tuesday 4pm in 558 Cory (Charlotte Jones)
• Class web site: http://inst.eecs.berkeley.edu/~ee105/spring03
Instructors

Professor
Costas Spanos (spanos@eecs.berkeley.edu)
Lecture: M-W-F 9-10am in 277 Cory
Office Hours: M-W-F 10-11am in 568 Cory

Discussion Teaching Assistants
Meghdad (Amin) Hajimorad (aminh@eecs.berkeley.edu):
Office Hours: M 1-2pm, Tu 12:30-1:30pm, 469 Cory
Sections: 101, 103
David Fang (dyfang@eecs.berkeley.edu):
Office Hours: M 4-5pm, 5-6, F 2-3pm, 469 Cory
Sections: 102, 104

Lab Teaching Assistants
Ray Liu (rayliu@eecs.berkeley.edu) Labs: 12, 14.
Maryam Ziaei-Moayyed (maryamzm@eecs.berkeley.edu) Labs: 13, 15.

Reader
Allan Gu (agu@uclink.berkeley.edu)

Basic Course Subjects

• Phasors and Frequency domain (2 weeks)
• Integrated Resistors and Capacitors (2 weeks)
• The MOSFET (1 week)
• P-N junctions and Bipolar Transistors (1.5 weeks)
• Single-Stage Amplifiers (3 weeks)
• Frequency Response of single stage Amps (1.5 weeks)
• Multistage Amps (2 weeks)
• Frequency Response of multistage Amps (1 week)
Sinusoidal Function Review

\[ v(t) = v \cos(\omega t + \phi) \]

- **amplitude** (half of peak-to-peak)
- **frequency** (radian) \( \omega = 2\pi f = 2\pi (1/T) \)
- **phase** (degrees or radians)

Graphical Description

\[ v_1(t) = v \cos(\omega t) \]
\[ v_2(t) = v \cos(\omega t - 45) \]
\[ \omega = \frac{2\pi}{T} \]
Why are Sinusoids Important?

- *Any* periodic signal \( v(t) \) can be expressed as a sum of sinusoidal signals by a Fourier series expansion (EECS 20N, EE 120)
- The response of a linear circuit to a sinusoidal input, as a function of its frequency \( \omega \), leads to insights into the behavior of the circuit.

Linear Circuits

- *Theorem:* solutions for voltages and currents in a linear circuit (i.e., one consisting of \( R, L, C \) and dependent sources \( G_m, R_m, A_v, \) and \( A_i \)) with a *sinusoidal* signal as the input are:
RC Circuit with Sinusoidal Input

\[ v_c(t) = V_c \cos(\omega t + \Phi) \]: solution is a sinusoidal signal with the same frequency, but with a different amplitude and phase-shifted with respect to the source

\[ v_s(t) = V_s \cos(\omega t) \]: set phase of source to zero (use as the reference)

Circuit Analysis
Circuit Analysis (Continued)

Graphical Result for Phase $\phi$

-45
-90
Graphical Result for Amplitude Ratio