Course Syllabus

ECE 149  
Active and Passive Network Synthesis  
(Elective)  
4 units

Catalog Description:
This course combines the areas of electronics and network theory in the subject of passive and active network design. Topics include passive synthesis, optimization techniques, approximations to ideal filters, distributed networks, sensitivity and the modern design techniques, and applications of active filters.

Prerequisites:
ECE 137A and 137B with a minimum grade of C-.

Text, References, and Software:
Software: Matlab, Code Composer 2.0 and Microsoft Office.

Topics Covered and Course Goals:
1. Active Op-Amp Circuit Design:
   1. Able to synthesize bilinear and biquad transfer functions using op-amps.
   2. Synthesize filters using asymptotic Bode plot specification.

2. Analog filter synthesis:
   1. Able to design Butterworth and Chebyshev filters from asymptotic specifications.
   2. Generate bandpass, bandstop, multiple bandpass filters using frequency transformations from lowpass prototypes.
   3. Synthesize above filters using op-amp circuits (Geffe, Sallen-Key.)

3. Digital filter design:
   1. Understand signal flow graph representation of digital filter structures.
   2. Able to design digital filters using impulse-invariance and bilinear transform techniques.

Class/Laboratory Hours:
Two 75 minute lectures per week. The Communications Teaching Laboratory (HFH 4152) is open to the students during building hours using keycard access. Minimum of 2 hours per week in the laboratory is required.
Contribution to Criterion 5

ECE 149 contributes to part (b) of Criterion 5. The course includes components of both engineering science and engineering design. The Science topics include complex analysis, Fourier, Laplace and Z-transforms needed to understand filter design and operation. The design topics include circuit design (using op-amps to synthesize filters) and software design (C-language implementation of digital filters). The process of filter design (by hand or using Matlab) and implementation in C-language is an iterative process requiring refinement of both algorithms and software.

Contribution to Program Outcomes:

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Prepared by: Ronald Iltis
Date: 3/20/08