ET 324 Linear Integrated Circuits

Course No. and Title: ET 324 Linear Integrated Circuits

Credit Hours: 4 (3 + 3P)

Course Description: This is the last course in the analog electronics sequence and covers two main areas: (1) It expands on linear circuit theory and introduces the student to transform network analysis with applications in passive and active filters; (2) It introduces the student to the fundamentals of discrete-time systems and digital signal processing with practical applications using a Texas Instruments DSP module in laboratory or simulation through the use of a spreadsheet.

Pre-requisites: ET 272, MATH 236 **Required Course**

Objective: To introduce the student to the mathematical analysis of linear passive and active circuits and to the fundamentals of discrete-time systems and digital signal processing.

Note: This course relates to ABET program outcomes a, b, c, d, e, f, and g as follows:
(a, b) Network analysis requires skillful application of circuit theorems and techniques.
(c, d) A number of lab experiments involve design steps prior to obtaining and analyzing experimental data.
(e) Students work in teams for laboratory experiments and projects.
(f) Students have to solve problems for homework, exams, and laboratory reports.
(g) Students have to write lab reports using proper written language.

	Course Topics:	**Class hours**
1.	General concepts of ac circuits. Impedance and admittance of passive networks. Sinusoidal, steady-state circuit analysis.	4
2.	Transform methods for two-port networks, input impedance, transfer functions, and Bode plots; time-domain form of input and output signals at specific frequencies.	9
3.	Basic concepts of continuous and discrete-time systems: sampling, sampling period, sampling rate, discrete data processing.	6
4.	Frequency content of continuous and discrete-time signals, signal spectra, the aliasing concept and sampling theorem (Nyquist rate).	8
5.	Processing of digital signals: Common structures, difference equations, impulse response.	9
6.	Digital filters: The bilinear transformation, frequency warping, implementations.	8

Computer Usage:

Students are required to simulate assigned electronic circuits using Pspice or Multisim. Students are not required to buy the software but they can obtain it for free through the Internet.

Laboratory Practice:

Major topics in the course are extensively practiced in laboratory through experiments designed by the instructor. Typical electronic instruments in the laboratory include: TEKTRONIX digital oscilloscope, TEKTRONIX function generator, FLUKE digital multimeters, CADET breadboard.

List of Lab Experiments:

- A Simple 2-port RC Network
- PSpice Simulation of a 2-port RL Network
- Frequency and Impedance Scaling in Filters
- Implementation of a 4^{th}-order Butterworth Filter
- First Experiences with the TMS320C3x Starter Kit
- Using Excel to Implement an IIR Function
- Excel Implementation of a Digital 3^{rd}-order Butterworth Filter
- Obtaining the Bode Plot of a Digital Transfer Function
- Implementation of a Bandpass Filter on the TI DSP module
- A Voice Recorder with the TI DSP Module

Oral and Written Communications:

Students are expected to write their lab reports using correct grammar, spelling, and syntax as described in a hand-out given to students at the beginning of the semester.

Calculus Usage:

Relationship of

Prepared by: Guillermo Rico Date: 10 December 2010