SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: ELECTRONIC CIRCUIT DESIGN AND ANALYSIS

Code No.: ELN - 311

Program: ELECTRONIC TECHNOLOGY

Semester: SIX

Date: MAY, 1986

Author: PETER SZILAGYI

New: X Revision: _____

APPROVED: _____ _____

Chairperson Date

CALENDAR DESCRIPTION

ELECTRONIC CIRCUIT DESIGN AND ANALYSIS	ELN-311
Course Name	Course Number

PHILOSOPHY/GOALS:

A project-oriented course at the technology level.

It addresses the need for the technologist to have a comprehensive understanding of the expanding applications of linear integrated circuits.

In addition, digital design concepts are studied - specifically combinational and sequential circuit design.

Associated lab projects will provide experimental back-up to the requirements of the circuit design lectures and previous electronic courses, like fiber optics, digital communications and communications systems.

METHOD OF ASSESSMENT (GRADING METHOD):

Written tests, quizzes 50%
Design assignments and hardware projects 50%

TEXTBOOKS:

NONE

Reference Books:

Linear Integrated Circuits Data Book
The TTL Data book for Design Engineers

TOPIC DESCRIPTION

BLOCK I - Two Port Parameters

- hybrid parameters: h_{11}, h_{12}, h_{21}, h_{22}, input impedance, forward current gain, output admittance, revers voltage ratio
- two port hybrid parameter equivalent network
- two port device connected to load and source
- hybrid parameters applied to bipolar function transistors
- CE, CB, CC, h parameter equivalent circuits
- conversion from h parameters to π parameters
- two port z parameters
- two port y parameters

BLOCK II - Voltage Regulation

- analysis of linear shunt regulators
- analysis of linear series regulators
- analysis of switching mode regulators
- line and load regulation
- design examples of transistorized regulators
- design examples of regulators with OP-amps
- design examples of regulator with dedicated monolithic integrated circuits (μA723, LH 605)
- short circuit protection
- fold back current limiting
- overvoltage protection
- heat sink design, thermal considerations
- remote shut-down regulator
- programmable output voltage regulators
- constant current generators
- precision current source and sink with OP amps
- monolithic 3 terminal adjustable current sources

BLOCK III - Active Filters

- ideal and practical filter characteristics
- butterworth, bessel, chebyshev and caver filters
- low pass, high pass, band pass and band stop filters
- firs, second and higher order filters
- filter gain, loss and phase shift calculations and characteristics
- filter design examples
- normalized unity gain multiple filter design
- notch filter analysis and design

BLOCK IV - Pulse and Clock Generators

- generators based on TTL and CMOS gates
- generators based on Schmitt triggers
- generators with integrated monostable multivibrators
- design examples of generators with variable frequency and duty cycle
- monolythic integrated circuit pulse generators

- logic controlled run-stop pulse generators
- the generation of a predetermined number of pulses
- pulse triggered pulse generators (burst generators)

BLOCK V - Pulse Amplifiers

- block diagram and applications
- pulse amplifier circuit diagrams and waveforms
- loading the pulse amplifier; the load line with resistive, inductive and transformer load
- the application of a damper diode
- losses in a pulse amplifier
- the pulse transformer
- the analysis of a pulse train SCR firing circuit
- design examples

BLOCK VI - Designing with Digital Integrated Circuits

- comparison of DTL, TTL, Schöttky, I^2L, ECL, CMOS, NMOS, PMOS logic families
- tristate digital integrated circuits
- function minimization using Karnaugh maps
- MSI and LSI circuits and applications (multiplexers, encoders, decoders, wired logic, bus system)
- sequential circuit analysis
- manual and automatic reset of sequential logic systems

BLOCK VII - IC Fabrication Techniques

- monolithic IC fabrication
- photo resist techniques
- the Planar Epitaxial process
- isolation techniques
- individual component formation
- state of the art and future trends