KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Electrical Engineering Department
EE-416 Analog Filter Design

Instructor: Dr. Hussain Alzaher, alzaherh@kfupm.edu.sa, Tel. 860-1434 **Office Hours:**

(I) Undergraduate Bulletin: Properties of network functions, Design of lossless two-port networks, Filter characteristics approximation: Butterworth, Chebyshev, Elliptic, and Bessel approximations. Frequency transformation. Design of active RC filters using operational amplifiers. Nonideal effects. Design using OTA's. Design using "MOSFET-C" circuits. Introduction to switched capacitor filters.

(II) Suggested

Properties of network functions:

1) General Characteristics of Filters
2) Approximation
3) Frequency Transformation
4) Sensitivity and Selectivity

Passive Filters:

5) Introduction, Second-order sections, High-order Filters: Cascade and LC Ladder
6) Two-port synthesis by Ladder Development

Ladder simulations by GIC, Operational Simulation

State-Variable Synthesis Techniques (Leapfrog topology)

7) Design of Resistively Terminated Networks
8) Design of Broadband Matching Networks

Active Filters

9) Single-amplifier Filters
10) Multiple-amplifier Biquads
11) Generalized Immittance Converter (GIC) Biquads
12) Higher-Order Filters

Filters, Delay Filters:

1) Time-Delay and Transfer Function
2) Equalization Procedure
3) Equalization with first-order and second-order modules

Continuous-Time Integrated Filters

13) Transconductance-C filters:

(a) A model of Transconducatance Cells
(b) Elementary Transconductor Building Blocks
(c) First and Second-order Secion
(d) High-order Filters: Cascade and Ladder

Switch Capacitor Filters

Applications

Hearing add Filters, Mobile Phones Baseband Filters,Buetooth Filters, WirlessLAN, Biomedical.

Computer analysis

References (Supplemental)

[1] Handouts of current international publications.
[2] Some well recognized texts on the subjects.

Assessment Policy

1. HW and Quizzes 20 % Two Exams 40% Project 10% Final 30%