

MODERN ANALOG/ INTEGRATED CIRCUIT FILTERS

Analysis & Design

An Overview

- ▣ Where Filters are used?
- ▣ Chronological evolution – techniques
- ▣ Integrated Circuits Support
- ▣ Other kinds of Filters
- ▣ Contents of the lecture note pack

Where Filters are Used?

- ▣ Electrical/ Electronic Communication
- ▣ Defence
- ▣ Entertainment
- ▣ Medical
- ▣ Aerospace Electronics

Chronological Evolution (Techniques & IC Support-I)

- ▣ Channel bank filters in FDM telephony (1915-), **L,C,R** elements. Frequencies to 4kHz
- ▣ Silicon IC, OP-AMP, Inductor-less Filters (1960-), Hybrid Thin and Thick Film Technology- **active RC Filters** used extensively in PCM codecs
- ▣ MOS IC technology, Transistors Switches, **Switched Capacitor Filters** (1970-)- Monolithic IC Filters (low-frequency)

Chronological Evolution (Techniques & IC Support-II)

- ▣ **Switched Current Filters** (all digital CMOS technology)
- ▣ Other Active Devices- **OTA (1980-..), CC (1990-..)**. Frequency range ~ tens of MHz
- ▣ Low Voltage, Low Power IC Filters – **Current Mode Filters**
- ▣ A Mobile Communication Filter (at the intermediate frequency of 100 MHz- GSM system)

Mobile Communication Filter Example

Chronological Evolution (Techniques & IC Support-III)

- ▣ Sub-micron IC technology, monolithic inductors . Frequency range ~GHz (Optical Communication Rx)
- ▣ IC Filters and VLSI system
- ▣ Example IC chip

Other Kinds of Filters

(not a part of this course)

- ▣ Mechanical Filters
- ▣ Charge Transfer Device Filter
- ▣ Crystal Filters
- ▣ Surface Acoustic Wave Filters
- ▣ Digital Filters

Contents of the Lectures

- ▣ Review of Network Theory - Ch.2
- ▣ Synthesis of Filter functions (Magnitude and Phase Approximations) - Ch.3
- ▣ Second Order Active Filters (OA,OTA and CC based) - Ch.5
- ▣ Second Order Switched-Capacitor Filters - Ch.6
- ▣ All-pole L,C ladder filters Realization - Ch.4
- ▣ High Order Filter Realization Techniques - Ch.7
- ▣ Integrated Circuit Filters - Ch.9
- ▣ Current-Mode Filters - Ch.8