



## **Analog Filter Design (Electrical and Electronic Engineering Design Series) (Volume 5)**

Nicholas L Pappas Ph.D.

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Electrical and Electronic Engineering Design Series Volume 5

Analog Filter Design

This university level Electrical Engineering text is for anyone who wants to know how to design analog filters.

The present text is unusually accessible to readers who want to acquire the skills of analog filter design. We present a thorough foundation so that you can proceed to learn how to design any filter.

This text is different from other filter design texts, because we actually design circuits, and not just talk about them.

And, we ask you to work hard doing experiments so that you acquire real world experience with commercially available electronic parts. This is about real learning.

We do not use the devastating phrase "it is obvious", because nothing is obvious to a person learning a subject.

Eight experiments are included that give life to the text's contents, and provide the reader with real world experience with making measurements, using instruments, and learning about all kinds of parts. We consider the experiments to be significant learning activities.

The analog filter design process is presented here for (1) the Bell Telephone Laboratories constant k, and m derived ladder filters, and (2) the modern Butterworth, Bessel, Chebyshev, and Inverse Chebyshev transfer functions and their synthesis methods. The designs produce filters one can build and use. Spice programs verify performance.

The text starts with a presentation of the properties of four terminal two port networks. The two port equations and tables provide significant support for the filter design processes.

The equations of the Bell Telephone Laboratories LC ladder filters are developed in a straightforward manner. The underlying idea is that of image impedance, which allows for cascading of filter sections. Spice programs plot filter transfer functions.

The lattice filter structure is not discussed.

The design of modern LC analog filters starts by showing how filters are specified. The Butterworth, Bessel, Chebyshev, and Inverse Chebyshev approximation methods of transfer functions T(p) are presented. The T(p) are converted into filter circuits by the transfer impedance synthesis method or the Darlington insertion loss synthesis method.

Transformation equations convert low pass filters into high pass, band pass, and band reject filters.

We show how to write AC analysis and TRAN transient response Spice programs that document filter performance. We include useful experiments that give you real world experience. We consider the experiments to be significant learning activities.

The experiments include elementary RLC filters, Bell Telephone Laboratories filters, active filters using op amps, and filters derived via approximations.

The presentations are eminently clear, because they are based on the policies assume nothing and nothing is obvious.

The present text's contents are topics one actually uses when engaged in analog filter design.



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