FILTER DESIGN

Pre Requisite Course: Electronic Circuit Design-II, Signals and Systems.
Credit Hours:
03
Contact Hours:
48

RECOMMENDED BOOKS

- Analog Filter Design, M. E. Van Valkenburg, Oxford University Press

REFERENCE BOOKS

- Network Analysis , M. E. Van Valkenburg, Third Edition, PHI.

OBJECTIVE OF COURSE

This course focuses on the design on analog filters and analog oscillators. The course begins by covering resistive operational amplifier circuits, magnitude, phase and Bode plot of Bilinear Transfer functions, Butterworth, Chebyshev, Cauer, and Bessel filter types, frequency transformations. Passive networks, op-amp filters, state-variable types, impedance converters, switched capacitors, and operational trans-conductance amplifiers will also be discussed. Analog oscillator analysis and design, including feedback and nonlinear-circuit analysis and amplitude stabilization will also be a part of this course.

S.NO	CLO/PLOS MAPPING	DOMAIN	PLO
01	**Apply** the knowledge of mathematics and engineering to **analyz**e analog filters.		01,05
02	To **analyze** and **design** different active filters that could be used in variety of applications.		01,05
03	Using frequency transformation method for **designing** active filter.		01,05
04	To **analyze** and **design** Oscillators		01,05

COURSE CONTENTS

Introduction to Analog Filter Design

Course overview, Motivation, and applications

- Resistor operational amplifier circuits
- Bilinear Transfer function and frequency response
- Classification of Magnitude and Frequency response
- Bode plot and design of passive filters
- Cascade design with first-order filters
- Biquad circuits: design parameters

Approximation Functions and Frequency Transformations

- Butterworth, Chebyshev, Cauer, and Bessel
- Low-pass, high-pass, band-pass, and notch filters
- Transfer-function transformations
- Circuit transformations

Op-amp Circuits and State-Variable Filters

- State-variable filters
- Cascade considerations

Passive Network Synthesis

- Positive-real and lossless functions
- Foster's and Cauer's realizations
- Lossless twoports
- Terminated LC ladders

Simulated Passives and Sensitivity

- Direct element replacement
- Impedance scaling and replacement
- Functional simulation
- Sensitivity

Op Amp Oscillators

- Simple Oscillator, Loop Gain
- Wein Bridge Oscillator and Amplitude stabilization