EC308: Analog Filter Design

Details of course:-

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Analog Filter Design	3	0	2	Signals and Systems, Network Analysis, Basic Electronics

Course Objective: To introduce the fundamental concepts of analog filters and their applications in signal processing and the design and analysis of passive and active analog filters.

Course Outcomes:
CO1: Analyze and classify analog filters based on their frequency response and transfer functions
CO2: Design passive and active analog filters using Butterworth, Chebyshev, and Bessel approximations
CO3: Evaluate the performance of analog filters in terms of frequency response, phase response, and stability.
CO4: Implement analog filter circuits using operational amplifiers and passive components
CO5: Apply analog filter design principles to real-world engineering problems in communication and signal processing.

S. No.	Content	Contact Hours
Unit 1	Overview of analog filters and their applications Classification of filters: low-pass, high-pass, band-pass, and band-stop. Filter specifications: passband, stopband, cutoff frequency, ripple, and roll-off Introduction to transfer functions and pole-zero plots	8
Unit 2	- RC, RL, and RLC circuits as basic filter structures, First-order and second-order passive filters, Frequency response, and Bode plots. Limitations of passive filters	10
Unit 3	Introduction to operational amplifiers (Op-Amps) in filter design, First-order and second-order active filters Sallen-Key topology and its variants Multiple feedback (MFB) filters	8

Unit 4	Butterworth filters: maximally flat magnitude response Chebyshev filters: equiripple response in passband or stopband Bessel filters: linear phase response Elliptic filters: equiripple in both passband and stopband Cascading first-order and second-order filters,Design of higher-order Butterworth and Chebyshev filters Sensitivity analysis and stability considerations	10
Unit 5	Component selection and practical considerations Tuning and testing of analog filters, Introduction to switched-capacitor filters Simulation of analog filters using MATLAB, SPICE, or Multisim Frequency response and transient analysis Comparison of theoretical and simulated results	6
	Total	42

Books:-

S. No	Name of Books/Authors/Publisher
1	Analog Filter Design/M. E. Van Valkenburg /Oxford University Press/1982
2	Design of Analog Filters/R. Schaumann and M. E. Van Valkenburg /Oxford University Press, 2001
3	Active Filter Design/Alan B. Williams /Artech House on Demand/1975