

# Filter Design

B.E. Sem. VII [ETRX]

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## EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

**Objective :** Filter is an important part of any electronic system. This course is to introduce the student the design of analog and digital filters ,adaptive filters and multirate signal processing.

**Pre-requisite :** Continuous and Discrete time signals and systems.

## SYLLABUS

### 1. Analog Filters

Filter specifications, Introduction to Butterworth Chebyshev, design (Derivation of T.F.), Elliptical filters, Frequency Transformations.

Low pass, high pass and band pass active filter realization, infinite gain single amplifier (LP,BP & HP) , positive and negative feedback infinite gain single amplifier filters, high order filters.

### 2. Direct Realization Methods

Active network elements for direct realization, inductance simulation frequency dependent negative resistors, leapfrog realization techniques, primary resonator block, switched capacitor filters.

### 3. IIR Filter Design

IIR filter design methodology, Design of Butterworth and Chebyshev filters using Impulse/step invariant method, matched Z Transform method, Bilinear transform Technique. Spectral transformations. Filter design by pole zero placements.

### 4. FIR Filter : Analysis and Design

Linear phase FIR filter and its types, FIR filter design using windows and Frequency sampling method, Half Band FIR filter design.

### 5. Adaptive Filters

Concept of adaptive filter ,MMSE criterion ,LMS and RLS algorithms ,Basic Weiner filter and its applications.

### 6. Multirate Digital Signal Processing

Concepts Decimation Interpolation ,sampling rate conversion by raional factor, polyphase structures, multistage implementation ,applications like subband coding and Quadrature mirror filtering.

## References :

1. Principles of Active network synthesis and design (*Govind Daryayani*) John Wiley publication.
  2. Active and passive analog filter design (*Lawrence P Huelson*) Tata- Mc-Grawhill publication.
  3. Digital Signal Processing A Practical approach (*E.C.Ifeachor and B.W Jervis*) Pearson Publication, second edition
  4. Digital Signal Processing (*Ashok Amardar*) Cengeg Learning Publication.
  5. Digital Signal Processing: Principles, Algorithms and applications (*J.G. Proakis, D. G. Manolakis*) Prentice Hall of India, 1995
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6. (*A.V. Oppenheim, Ronald W Schafer*) Prentice Hall, 1983.
7. Digital Filter analysis and applications (*A.Antoniou*) Tata McGraw-Hill Publication.
8. Adaptive filters (*Siman Hykin*) PHI Publications
9. Digital signal processing (*S.Salivahanan, A. Vllaraja, C.Ganapriya*) Mc Graw Hill, 2<sup>nd</sup> edition
10. Multirate systems and Filter Banks (*P.P.Vaidyanathan*) Prentice Hall of India 2006
11. Digital signal processing : system analysis and design (*Diniz ,da sillva, Netto*) Cambridge university press
12. Linear systems and signals (*B.P.Lathi*) Oxford University Press second Indian Impression, 20007.
13. Digital Signal Processing (*S.K. Mitra*) Tata McGraw-Hill Publication, 2001
14. Digital signal processing (*Chi-tsong Chen*) Oxford University Press
16. Digital signal processing:fundamentals and applications (*Li Tan*) Academic press

