**M.Tech. (DECS) I Semester**

**13EC1105-TRANSFORM TECHNIQUES**

Credits: 4  
Hours /week: 4 Hrs Sessional Marks: 40  
Univ.Exam.Duration: 3Hrs Univ.Examination.Marks: 60

**UNIT I**

**REVIEW OF TRANSFORMS**: Signal spaces, concept of convergence, Hilbert spaces for energy signals, Fourier basis, FT-failure of FT-need for time-frequency analysis, Continuous FT, DTFT, Discrete Fourier Series and Transforms, Z-Transform, relation between CFT-DTFT, DTFT-DFS,DFS-DFT, Walsh-Hadamard, Haar, Slant, KLT, Hilbert Transforms – definition, properties and applications.

**UNIT II**

**CWT & MRA**: Time-frequency limitations, tiling of time-frequency plane for STFT, Heisenberg uncertainty principle, Short time Fourier Transform (STFT) analysis, short comings of STFT, Need for wavelets- Wavelet Basis, Continuous time wavelet Transform Equation- Need for scaling Function- Multi resolution analysis, Tiling of time scale plane for CWT. Important Wavelets : Haar, Mexican Hat Meyer, Shannon, Daubechies

**UNIT III**

**MULTIRATE SYSTEMS** **, FILTER BANKS AND DWT**: Basics of Decimation and Interpolation in time & frequency domains, Two-channel Filter bank, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet basis, DWT Filter Banks For Daubechies Wavelet Function.

**UNIT-IV**

**SPECIAL TOPICS**: Wavelet Packet Transform Multidimensional Wavelets, Bi-orthogonal basis-B-splines, Lifting Scheme of Wavelet Generation, Multi Wavelets.

**UNIT-V**

**APPLICATIONS OF TRANSFORMS**: Signal Denoising, Subband Coding of Speech and Music, Signal Compression - Use of DCT, DWT,KLT, 2-D DWT, Fractal Signal Analysis

**TEXT BOOKS:**

1. “Fundamentals of Wavelets- Theory, Algorithms and Applications”, Jaideva C Goswami, Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.

2. Wavelet Transforms-Introduction theory and applications-Raghuveer M.Rao and Ajit S. Bopardikar, Pearson edu, Asia, New Delhi, 2003.

3. “Insight into Wavelets from Theory to practice “, Soman.K.P, Ramachandran. K.I, Printice Hall India, First Edition, 2004.

**REFERENCE BOOKS:**

1. “Wavelets and sub-band coding”, Vetterli M. Kovacevic, PJI, 1995.

2“Introduction to Wavelets and Wavelet Transforms”, C. Sydney Burrus, PHI, First Edition, 1997.

3. “A Wavelet Tour of Signal Processing”, Stephen G. Mallat. Academic Press, Second Edition,