

C O N T E N T S

Preface	X
0. Preliminaries and Definitions	1
0.1) Definitions and Theorems	1
1. Convolution and Correlation	12
1.1) Convolution Integration	12
1.2) Correlation	21
1.3) Fourier Series	27
1.4) Waveform Sampling	33
2. The Discrete Fourier Transform	36
2.1) A Graphical Development	36
2.2) Theoretical Development	37
2.3) Band-Limited Periodic Waveform	42
2.4) Discrete Convolution and Correlation	49
2.5) Applying The Discrete Fourier Transform	52
3. Fast Fourier Transform	55
3.1) Matrix Formulation	55
3.2) Transform of $2N$ -Samples With an N sample Transform	66
3.3) FFT Convolution and Correlation	67
3.4) Theoretical and Development of the Base-2 FFT Algorithm	74

3.5) FFT Algorithms for Arbitrary Factors	82
4. Discrete Wavelet Transform	85
4.1) Introduction	85
4.2) Approximating Vectors in Nested subspaces of a Finite Dimensional Linear Vector Space	86
4.3) Approximating vectors in Nested Subspaces of an Infinite Dimensional Linear Vector Space	88
4.4) Bases for the Approximations Subspaces and Haar Scaling Function	92
4.5) Bases for the Detail Subspace and Haar Wavelet	93