

ECMC2T6C: DSP processors and Architectures

Unit I: Introduction to Digital Signal Processing

Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

Unit II: Computational Accuracy in DSP Implementations

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

Unit III: Architectures for Programmable DSP Devices

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Unit IV: Execution Control and Pipelining

Hardware looping, Interrupts, Stacks, Relative Branch Support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

Unit V: Programmable Digital Signal Processors

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX Processors, Program Control, TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Unit VI: Implementations of Basic DSP Algorithms

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

Unit VII: Implementation of FFT Algorithms

An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

Unit VIII: Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS

1. Digital Signal Processing – Avtar Singh and S.Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features - Lapsley et al. S. Chand & Co, 2000.

REFERENCES

1. Digital Signal Processors, Architecture, Programming and Applications- B. Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing - Jonatham Stein, John Wiley, 2005.