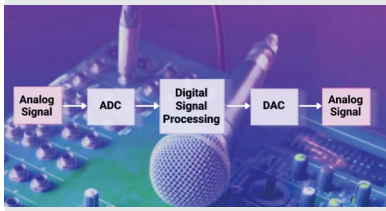
22EE308 DIGITAL SIGNAL PROCESSING



Source: https://medium.com/@astontechnologies/digital-signal-processing-71d5206cacfe

Hours Per Week :

L	T	P	C
2	2	0	3

PREREQUISITE KNOWLEDGE: Fourier and Laplace transformation.

COURSE DESCRIPTION AND OBJECTIVES:

To understand the representation of discrete time signals and systems with discrete inputs both in time domain and frequency domain as these constitute basics for DSP. To study both direct and inverse z-transforms, DFT (Discrete Fourier Transforms), FFT (Fast Fourier transforms) and their properties in detail. To design and realize various infinite impulse response (IIR) & finite impulse response (FIR) filters and study their properties. To provide idea about DSP based processing.

MODULE –1

UNIT-1 **8L+8T+0P=16 Hours**

INTRODUCTION TO DISCRETE TIME SIGNALS AND SYSTEMS:

Review of signals and systems, linear shift invariant systems, Stability and causality, Frequency domain representation of discrete time signals and systems. Z-transform and properties, Linear constant coefficient difference equations, Impulse response, Step response.

UNIT-2 **8L+8T+0P=16 Hours**

DFT AND FFT:

Discrete fourier representation of periodic sequences (DTFT), Properties, Frequency response, Discrete Fourier Transform - properties of DFT, Linear convolution of sequences using DFT, Computation of DFT, Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT algorithms.

PRACTICES:

- Simulate the system for impulse and step inputs.
- Identify the accelerating methods for processing through DFT & FFT.
- Design FIR/IIR filters for removing unmounted frequencies in the signal.
- Study the relation between Laplace transform and discrete Fourier transform.

MODULE-2

UNIT-1 **10L+10T+0P=20 Hours**

DESIGN AND REALIZATION OF FILTERS:

FIR Filter: FIR system function, Characteristics of FIR digital filters, Frequency response, Design of FIR digital filters using window techniques, Structures of FIR – direct form structure, cascade form structure, linear phase structure.

IIR Filter: IIR system function, Analog filter approximations – Butter worth and Chebyshev; Design of IIR digital filters from analog filters, Analog-to-digital transformations, Structures of IIR - direct form I and II, cascade form, parallel form, signal flow graph and transposed structures; Comparison of IIR and FIR filters.

SKILLS:

- ✓ *Analysis the Discrete systems by using DFT & FFT.*
- ✓ *Analyse the notch filter implementation.*
- ✓ *Analyse the stability of the system.*

UNIT-2 **6L+6T+0P=12 Hours**

DIGITAL SIGNAL PROCESSORS AND APPLICATIONS:

Introduction to DSP processor, Memory architecture, Pipelining, Features of TMS320 family DSP processor, Digital signal processing based speed control of industrial motor drives.

PRACTICES:

- Design FIR, IIR filters for removing unwanted frequencies in the signal.
- Identify the type and order of the filter for a given application.
- Analyse the stability of the designed filter.
- Write a program for PI controller using code composer studio.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply different transformations and operations on signal.	Apply	1	1, 2, 9, 11
2	Apply discrete Fourier transforms and fast Fourier transform for different types of signals, interpret the information obtained and able to reconstruct it as well as to apply Z-transform on a system to get its response.	Apply	1	1, 2, 9, 11
3	Identify the need of digital signal processing in field of electrical engineering and know the features of TMS 320 family digital processor.	Apply	2	1, 2, 3, 9, 11
4	Design FIR filters and its realizations.	Create	2	1, 2, 3, 9, 11
5	Realize IIR filters.	Create	2	1, 2, 3, 9, 11

TEXT BOOKS:

1. John G. Proakis and Dimitris G. Manolakis “Digital Signal Processing: Principles, Algorithms & Applications”, Pearson Education, 2007.
2. A.V. Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, 3rd edition, Pearson Education, 2014.

REFERENCE BOOKS:

1. Ramesh Babu, “Digital Signal Processing”, 6th edition, Scitech, 2014.
2. M.H. Hayes, “Digital Signal Processing: Schaum’s outline”, TATA Mc Graw Hill, 2007.
3. A. Nagoor Kani, “Digital Signal Processing”, 2nd edition, TATA Mc Graw Hill, 2017.