

**University of Computer Studies (Thaton)**

**2025-2026 Academic Year**

**Fifth Year (B.C.Tech.)**

**Lecture Plan**

**CT-5134 Digital Signal Processing**

**First Semester**

- References.** : 1. Digital Signal Processing Fundamentals and Applications by Li Tan, Elsevier Inc., 2008.  
 : 2. Digital Signal Processing by A. Nagoor Kani, 2nd Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2012.  
 :3. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, 2<sup>nd</sup> Edition, California Technical Publishing, California, 1999.

**Prerequisites** : CT-4235 Signals and Systems

**Period** : 64 periods for 16 weeks (4 periods/week)

| No | Chapter   | Period | Page   | Ref. no | Detail Lecture Plan        |
|----|---|--------|--------|---------|----------------------------|
| 1. | <b>Chapter 1 Introduction to Digital Signal Processing</b><br>1.1 Basic Concepts of Digital Signal Processing<br>1.2 Basic Digital Signal Processing Examples in Block Diagrams<br>1.3 Overview of Typical Digital Signal Processing in Real-World Applications<br>1.4 Digital Signal Processing Applications | 3      | 1-12   | 1       | All Examples and Questions |
| 2. | <b>Chapter 2 Signal Sampling and Quantization</b><br>2.1 Sampling of Continuous Signal<br>2.2 Signal Reconstruction<br>2.3 Analog-to-Digital Conversion, Digital-to-Analog Conversion, and Quantization   | 5      | 13-51  | 1       | All Examples and Questions |
| 3. | <b>Chapter 3 Digital Signals and Systems</b><br>3.1 Digital Signals<br>3.2 Linear Time-Invariant, Causal Systems<br>3.3 Difference Equations and Impulse Responses<br>3.4 Bounded-in-and-Bounded-out Stability<br>3.5 Digital Convolution   | 4      | 57-83  | 1       | Overview                   |
| 4. | <b>Chapter 4 Discrete Fourier Transform and Signal Spectrum</b><br>4.1 Discrete Fourier Transform<br>4.2 Amplitude Spectrum and Power Spectrum<br>4.3 Spectral Estimation Using Window Functions<br>4.4 Application to Speech Spectral Estimation<br>4.5 Fast Fourier Transform                               | 6      | 87-131 | 1       | All Examples and Questions |

| No | Chapter  | Period | Page    | Ref. no | Detail Lecture Plan        |
|----|--|--------|---------|---------|----------------------------|
| 5. | <b>Chapter 5 The z-Transform</b><br>5.1 Definition<br>5.2 Properties of the z-Transform<br>5.3 Inverse z-Transform<br>5.4 Solution of Difference Equations Using the z-Transform   | 6      | 135-156 | 1       | All Examples and Questions |
| 6. | <b>Chapter 6 Digital Signal Processing Systems, Basic Filtering Types, and Digital Filter Realizations</b><br>6.1 The Difference Equation and Digital Filtering<br>6.2 Difference Equation and Transfer Function<br>6.3 The z-Plane Pole-Zero Plot and Stability<br>6.4 Digital Filter Frequency Response<br>6.5 Basic Types of Filtering<br>6.6 Realization of Digital Filters<br>6.7 Application: Speech Enhancement and Filtering   | 7      | 159-209 | 1       | All Examples and Questions |
| 7. | <b>Chapter 7 Finite Impulse Response Filter Design</b><br>7.1 Finite Impulse Response Filter Format<br>7.2 Fourier Transform Design<br>7.3 Window Method<br>7.4 Applications: Noise Reduction and Two-Band Digital Crossover<br>7.5 Frequency Sampling Design Method<br>7.6 Optimal Design Method<br>7.7 Realization Structures of Finite Impulse Response Filters<br>7.8 Coefficient Accuracy Effects on Finite Impulse Response Filters<br>7.9 Summary of Finite Impulse Response (FIR) Design Procedures and Selection of FIR Filter Design Methods in Practice | 7      | 215-294 | 1       | All Examples and Questions |
| 8. | <b>Chapter 8 Infinite Impulse Response Filter Design</b><br>8.1 Infinite Impulse Response Filter Format<br>8.2 Bilinear Transformation Design Method<br>8.3 Digital Butterworth and Chebyshev Filter Designs<br>8.4 Higher-Order Infinite Impulse Response Filter Design Using the Cascade Method<br>8.5 Application: Digital Audio Equalizer  | 8      | 303-402 | 1       | All Examples and Questions |