Department Of Computer Science and Engineering
Kathmandu University
Dhulikhel, Kavre

Subject: Digital Signal Processing   **Course: COMP 407**

Level: B.E. 4th Year 1st Semester   **Credit Hours: 3**

Course Objective: To provide a thorough understanding of the signals, systems, and discrete-time signal processing for undergraduate computer engineering students. The goal of the course is to develop a complete working set of digital signal processing notions from the ground up.

Syllabus

1. **Introduction to signals and systems**
   1.1. Definition and uses of Signals, Classification, some common signals.
   1.2. Transformation of independent and dependent variables, Definition of Systems, System Properties.
   1.3. Signal Representation by pulses, DT LTI systems, Convolution Sum, Properties of LTI system.
   1.4. Frequency domain analysis of signal and systems, transfer functions, and frequency response.

2. **A sampling of Continuous-time signals**
   2.1. Sampling, Impulse Train
   2.2. Nyquist Theorem, Aliasing
   2.3. Signal Reconstruction

3. **Fourier Analysis**
   3.1. CT Fourier Series and Fourier Transforms.
   3.2. DT Fourier Series and DT Fourier Transform
   3.3. Definition and Properties. DTFT of some popular signals.

4. **Discrete Fourier Transform**
   4.1. Discrete Fourier Transform, Properties.
   4.2. Fast Fourier Transform
   4.3. Evaluation of DFT, FFT

5. **Z-transform**
   5.1. Z- Transform, Definition, ROC, Z- Transform of popular signals
   5.2. Properties of Z- transform
   5.3. Inverse Z- Transform, Pole Zero relationships
   5.4. System Function, pole-zero relationship.

6. **Discrete Filters**
   6.1. Discrete filter structure, FIR – IIR Filters
   6.2. Structure for FIR filters: Direct form Structures, Cascade
   6.3. Structure for IIR filters: Direct form Structures.Cascade, Parallel
   6.4. Lattice & Ladder Structure.

7. **IIR Filter Design**
   7.1. Polynomial Approximation, Butterworth, Chebyshev
   7.2. Design by matched Z-transform, Impulse Invariant Transform and Bilinear Transform

8. **FIR Filter Design**
   8.1. FIR Design by Windows, Gibbs phenomena
   8.2. Frequency Sampling.
   8.3. Linear Phase FIR.

Reference Book:
   1. J.G. Proakis and D.G. Manolakis, Digital Signal Processing, Prentice-Hall of India.
   2. A.V. Oppenheim, Discrete-Time Signal Processing, Prentice-Hall, 1990.