Course Title: Digital Signal Processing
Course Code: EC-313
Credit Hours: 3+1
Course Objective:

1. This course presents the fundamental concepts of digital signal processing and analysis techniques. Digital Signal Processing issues are emphasized.
2. Digital signal processing focuses on the fundamentals of signal and system analysis, focusing on representations of discrete-time, continuous-time signals (singularity functions, complex exponentials, geometrics, Fourier representations, Laplace, Z transforms, sampling) and representations of linear, time-invariant systems (difference and differential equations, block diagrams, system functions, poles and zeros, convolution, impulse, step responses, frequency responses). Applications are drawn broadly from engineering and physics, including feedback, control, communications, and signal processing.
3. **Contents:**
    a. Introduction to signal and system
    b. Representations of discrete-time and continuous-time signals
    c. Representations of linear time-invariant systems
    d. Fourier representations
    e. Discrete Time Fourier Transform
    f. Laplace and Z transforms
    g. Sampling and Quantization
    h. Filter Designing and Analysis
    i. Multi-rate Signal Processing
    j. Discrete Fourier Series and Discrete Fourier Transform
    k. Fast Fourier Transform

4. **Details of lab work**

    a. Introduction to MATLAB
    b. Programming in MATLAB for implementing signal processing algorithms.
    c. Convolution of Discrete Time Systems Using Flip and Drag Method and Difference Equation
    d. Computation of Fourier Transform
    e. Equalization through Frequency Bands
    f. System Analysis Using fvtool
    g. Introduction to DSP Processors (DSK6713 and DSK6416)
    h. Generating Sine and Square Wave on DSK6713
    i. Static Linear Convolution via DSK
    j. Multi-rate Sampling of Discrete Signals (MATLAB)

k. Implementation of Interpolation using Poly-phase decomposition (MATLAB)
l. Design and Implementation of FIR and IIR filters (MATLAB)
m. Circular Convolution (MATLAB)
n. Discrete Time Fourier Transform and its properties (MATLAB)
o. Impulse Response of First and Second Order Systems on DSK
p. Introduction to SYS BIOS (RTOS for DSK)
q. Real-time Convolution via Interrupts on DSK using built-in ADC
r. Programming Digital Signal Processor: Basic skills in programming TMS320C6x
s. Implementation of signal processing techniques using real time data on TMS320C6x

5. **Textbook:**
   a. "Discrete Time Signal Processing", Second Edition, Oppenheim
6. **Reference Books:**
   a. "Digital Signal Processing-A practical Approach", Ifeachor Jervis, Prentice Hall
   b. "DSP First: A multimedia approach", James H. McClellan, Ronald W. Schafer, Mark
      A. Yoder, Prentice Hall
   c. "Digital Signal Processing: A Computer-Based Approach", S.K. Mitra, McGraw-Hill, Latest Issue.