Course Outline
1)  Discrete Signals and Systems, Z-transform, and Discrete Fourier Analysis
Discrete signals and systems; Z-transform; discrete-time Fourier transform (DTFT); transform
domain analysis of signals and systems; discrete Fourier series (DFS) and transform (DFT); fast
Fourier transform (FFT).

2)  Digital Filter Design
Finite impulse response (FIR) filter design; infinite impulse response (IIR) filter design.

3)  Digital Processing of Analog Signals
Bandlimited signals and Shannon’s sampling theorem; reconstruction from sampling.

4)  Multi-Rate Digital Signal Processing
Discrete sampling rate conversion; narrowband and short time Fourier transform and analysis;
spectrogram; analysis-synthesis filter banks and multi-resolution analysis.

5)  Multi-Dimensional Digital Signal Processing
Multi-dimensional DFT and FFT; multi-dimensional filter design; multi-dimensional general sampling lattice.

6) **Digital Signal Processing and Machine Learning**
Neural networks; convolutional neural networks; machine learning for digital signal processing.

**Textbooks and References**
No required textbook. Lecture notes and study materials will be posted at LEARN. Additional reference books and materials include (but not required)

**Homework**
Both paper and computer homework assignments/solutions will be posted at LEARN. Homework assignments are not graded but are important to after-exam happiness. Computer homework uses MATLAB as an analysis, design and visualization tool.

**Exam and Grading**
There will be one midterm exam and one final exam.
Mark1 = 0.3 (midterm exam grade) + 0.7 (final exam grade)
Mark2 = 0.5 (midterm exam grade) + 0.5 (final exam grade)
Overall grade = max{Mark1, Mark2}