Digital Signal Processing: Theory and Practice

Course Introduction

Sivakumar Balasubramanian

Department of Bioengineering
Christian Medical College, Bagayam
Vellore 632002

What is the course about?

- Course on the theory and practice of digital signal processing techniques.
- Primary focus will be on understanding:
  - Foundations of modern signal processing.
  - Discrete-time signal representation and analysis.
  - Discrete time system analysis and synthesis.
  - Design, implementation and analysis of frequency-selective filters.
  - Understanding and analysis of practical issues in real-time DSP algorithm implementation.
  - Hands on experience in applying theory to solve real problems.

What to expect from the course?

- An introduction to the foundations of signal processing.
- A good understanding of the theory discrete-time signals and systems.
- Ability to analyze and synthesize digital filters.
- Ability to practically implement DSP algorithms in hardware.

Pre-requisites

- Basic understanding of real and complex analysis.
- Basic understanding of calculus (limits, differentiation, integration).
- Experience in programming (C and Python (or Matlab) would be ideal).

Course Scoring and Grading

Total: 100 $[12 + 15 + 8 + 20 + 45]$

- Lab assignments: 30
- Surprise quiz: 10
- Mid-term: 15
- Final: 45

Late submissions will be corrected but not graded.

Course Scoring and Grading

Grading policy: **No relative grading**

- A+: Score $\geq 90/100$
- A: $80 \leq$ Score < 90
- B: $70 \leq$ Score < 80
- C: $60 \leq$ Score < 70
- D: $50 \leq$ Score < 60
- E: $40 \leq$ Score < 50
- F: Score < 40

Academic dishonesty will automatically fetch the person a 'F' grade.

Course content

1. Mathematical preliminaries
2. What are digital signals and systems?
3. Some useful and important signals
4. Sampling, quantization and number representation
5. Geometric signal theory
6. Discretetime LTI systems
7. Discrete-time Fourier transform and its properties
8. Z-transform and its properties
9. Analysis of discrete-time LTI systems
10. Discrete Fourier Transform and its properties
11. Fast Fourier Transform
12. Design and analysis of digital filters
13. Practical aspect of DSP algorithm implementation
14. Understanding random signals
15. Spectral analysis