## **ELEC 556: Digital Signal Processing (3 credits)**

Digital Signal Processing (DSP) is an essential discipline in modern engineering, focusing on the analysis and manipulation of digital signals using mathematical and computational techniques. This course provides a comprehensive overview of the principles and applications of DSP. Students will explore the fundamentals of digital signals and systems, learn various transform techniques, and implement algorithms for signal processing tasks such as filtering, modulation, and spectral analysis. Practical applications across different fields like telecommunications, audio processing, and biomedical engineering will be emphasized throughout the course.

**Course Learning Outcomes:**

By the end of the course, students will be able to:

A1. Demonstrate critical knowledge and understanding of digital signal processing, including discrete-time signals and systems.

A2. Employ practical DSP software tools and hardware platforms to simulate and implement signal processing systems.

B1. Develop DSP algorithms for real-world applications, including signal compression, modulation, and digital communications.

B2. Evaluate digital filters, both FIR (Finite Impulse Response) and IIR (Infinite Impulse Response), for signal enhancement and noise reduction.

B3. Effectively communicate DSP techniques and systems in both written and oral form to both technical and non-technical audiences.

C1. Collaborate effectively in a team environment during DSP projects development.

**Course Learning Materials:**

* John G. Proakis and Dimitris K. Manolakis, " Digital Signal Processing: Principles, Algorithms, and Applications", 4th ed., Pearson, 2017.
* Alan V. Oppenheim and Ronald W. Schafer, " Discrete-Time Signal Processing ", 3rd ed., Pearson, 2009.

**Course Content:**

1. Introduction to Digital Signal Processing
2. Discrete-Time Signals and Systems
3. Z-Transform
4. Frequency Analysis of Signals
5. Digital Filter Design and Implementation
6. Sampling and Reconstruction
7. Advanced Filtering Techniques
8. DSP in Practical Applications
9. DSP Implementation and Real -Time Processing