UNIVERSITY OF DELTA, AGBOR, NIGERIA
COMPUTING
INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)
B.Sc. Information and Communication Technology

UNIDEL-CSC 207: Digital Signal Processing (3 Units; Compulsory; LH 45)

Senate-approved Relevance
The training of graduates who are effective and efficient in the use and application of Digital Signal processing techniques is of core interest to the society. The trained and skilled graduates are capable and will be able to create a sustainable environment for the people of Delta state. The availability and understanding of these devices possessed by our graduates will create market for the people within and around the environment which is in tandem with the mission and vision of UNIDEL. The relevance of this is seeing computing graduates of UNIDEL with demonstrable potentials and skills to answer pressing modern concerns of Digital signal processing in the environment and most especially in Nigeria.

Overview
The representation of signals in terms of sequences of digital numbers and the use of digital computers to process these signals to either analyze or modify the original signal is termed as Digital Signal Processing and in short DSP.

The topics covered in this course include fast algorithms for the computation of DFT, Fast Fourier transform, Finite length discrete transforms, Discrete Cosine Transform, Estimation of spectra from finite-duration observations of signals, Implementation of discrete-time systems, Floating-point and fixed-point representations, Multi-rate signal processing, Adaptive filters and applications.

Objectives
The objectives of this course are to: (i) demonstrate a good understanding of modeling and analysis discrete-time signals and systems. (ii) Explain spectral analysis (Fourier analysis: DTFT, DFT) to analyze signals and systems. (iii) Investigate techniques for efficient and real-time implementation of signal processing algorithms. (iv) Determine algorithm complexity (v) Evaluate signal processing and real-time implementation techniques. (vi) Illustrate the use of specialized engineering tools to develop DSP code. (vii) Identify software tools for the design of real time digital filters.

Learning Outcomes
Upon completion of this course, students should be able to: (i) Identify basic elements of digital processing (ii) Differentiate between analog and digital signals (iii) Discuss different forms of impulse response digital filters (iv) Discuss digital signal processing techniques (v) Identify elements of python programming (vi) Design software tools for the simulation and modeling of digital signals (vii) Identify software tools for the design of real time digital filters.

Course Content

Basic elements of digital signal processing. Introduction to discrete Fourier transform. Structure of infinite impulse response. Symmetric and anti-symmetric finite impulse response filters. Finite word length effects in finite impulse response and infinite impulse response digital filters. Application of digital signal processing. Linear Time-Invariant. Causal Systems. Linearity. Time-invariance. Causality. Difference Equations and Impulse Responses. Format of Difference Equation. System Representation using its Impulse Response. Bounded-in-and-Bounded-out Stability. Digital. Discrete Fourier Transform. Spectral Estimation using Window Functions, Application to Speech Spectral Estimation. Fast Fourier Transform. Python Programming language. Software tools for the simulation. Design of real-time digital filters.

Minimum Academic Standard:
NUC minimum academic standard requirements for facilities.