NILE UNIVERSITY OF NIGERIA
HONORIS UNITED UNIVERSITIES

NILE UNIVERSITY OF NIGERIA
FACULTY OF ENGINEERING
DEPT. OF COMPUTER ENGINEERING

COURSE SYLLABUS

A. CATALOG DATA

Course Code	CPE 423				
Course Name	Digital Signal Processing				
Level	⦿Undergraduate		○ Graduate		
Course Language	⦿ English				
Course Type	⦿ Required Core Course ○ Technical Elective		○ Required Major Area Course ○ Non-Technical Elective		
Credits	***Theory***	***Practice***	***NTNU Credit***	***ECTS***	***Workload***
	3		3	3	3
Prerequisites	• Signals and System • Linear algebra		• Calculus • Trigonometry		
Corequisities					
Course Instructor	Dr. Ali Nyangwarimam Obadiah	***Email***	***Office***	***Office Hours***	
		ali.obadiah@nileuniversity.edu.ng	Room 015A Block C	Open doors!	
Teaching Assistant	None	***Email***	***Office***	***Office Hours***	
Lecture Hours					
Course Overview	Introduction to Digital Signal Processing; design of analogue filters; design of digital filters (IIR and FIR); structures for the realization of digital filters; random signals and random processes; linear estimation and prediction; Wiener filters; DSP processor architecture; DSP algorithms for different applications.				

B. TEXTBOOKS AND REFERENCES

Textbooks	Smith, Steven W. "The scientist and engineer's guide to digital signal processing." (1997): 35. Orfanidis, Sophocles J. Introduction to signal processing. Prentice-Hall, Inc., 1995.
Handout	Course notes and supporting materials will be made available
References	Proakis, John G. Digital signal processing: principles algorithms and applications. Pearson Education India, 2001. Hayes, Monson H. *Schaum's outline of digital signal processing*. McGraw-Hill, Inc., 1998.

C. COURSE LEARNING OUTCOMES

Learning Outcomes

By the end of the course, students should be able to achieve the following course learning outcomes

No.	Course Learning Outcome	Programme Outcome	Taxonomies and Soft-Skills	Assessment Methods
CLO1	Analyse and evaluate the properties of LTI systems in terms of z-transforms.	PO1	C1, C2, C3	HW, T, F
CLO2	Apply the concept of discrete signal processing.	PO2, PO3	C1, C2, C3	T, F

CLO3	Analyze complex engineering problems in signals and systems using discrete signal processing.	PO3	C4	T, F
CLO4	Solving complex engineering problems that involve digital filter using software.	PO4	C5	A
CLO5	Evaluate design problems related to frequency selective processing and design FIR/IIR filters.	PO2	C4	T, F, A
CLO6	Communicate effectively.	PO8, PO9, PO10	C4, A3	A, Pr

T – Test ; A – Assignment; Q – Quiz; HW – Homework ; Pr – Presentation; F – Final Exam; Cl - Classwork

PO1 – Engineering Knowledge; PO2 – Problem Analysis; PO3 – Design/Development of Solutions; PO4 – Investigation; PO5 – Modern Tool Usage; PO6 – The Engineer and Society; PO7 - Environment and Sustainability; PO8 - Ethics; PO9 - Individual and Team Work; PO10 - Communication; PO11 - Project Management; PO12 - Lifelong Learning

C1 – Knowledge; C2 – Comprehensive; C3 – Application; C4 – Analysis; C5 – Synthesis;

C6 – Evaluation; A1 – Receiving; A2 – Responding; A3 – Valuing; A4 – Organisation; A6 – Internalising; P1 – Imitation; P2 – Manipulation; P3 – Precision, P4 – Articulation; P5 - Naturalisation

D. TEACHING AND LEARNING METHODS

Teaching methods	• The course consists of lectures, discussions and learning by exercise which explore the different facets of the theory • This course relies on face to face sessions as the primary delivery mechanism for the material. Exercises provide practice in problem solving and enhance the understanding of the course topics. Graded homework, quizzes and tests provide formative and summative assessment opportunities, for students to measure their progress throughout the semester. • This course shall expose the student to the use of MATLAB in digital Signal Processing

E. COURSE CONTENTS

Topics	**1.** An introduction to signals and systems, and signal processing
	2. Discrete Time Signals and Systems
	3. Fourier Transformation
	4. Z Transform and its application to the Analysis of LTI Systems
	5. Frequency Analysis of Signals and Systems
	6. The Discrete Fourier Transform
	7. Structure of Digital Filter
	8. Design of Digital Filters
	9. DSP Processor Architecture

F. WEEKLY LECTURE PLAN

Week	***Dates***	***Assessment /Activity***	***Topics***
1			Introduction to course
2			Introduction to Digital Signal Processing • Overview of Signals, Systems and Signal Processing • Classification of signals and systems • Representation of Signals and systems • Continuous and Discrete Time Signal

			• Advantages and Disadvantages of DSP • Application of DSP
3			Discrete Time Signals and systems 1 • Representation of Discrete Time signal and Systems • Discrete Time Signal Examples and Simple Manipulations of Discrete Time Signal and System • Classification of Discrete time Signals and System
4			Discrete Time Signals and Systems 2 • Analysis of Discrete Time Linear Time-Invariant Systems • Implementation of Discrete Time systems
5			Linear Time Invariant Systems (LTI) • Difference Equation • Impulse Response • Types of Impulse response • Convolution • Properties of LTI systems
6			Z Transform and its application to the Analysis of LTI Systems • The Z Transform formulation • Region of Convergence (ROC) • Impulse response test • Characteristics of ROC
7			Inverse Z Transform and its application to the Analysis of LTI Systems • Z transform pair • Partial fraction expansion
8			**MID-SEMESTER EXAMINATION**
9			LTI System Function • Spectrum representation of discrete time signals • Fourier transformation family
10			DISCRETE TIME FOURIER TRANSFORM (DTFT) • Transform formulation • DISCRETE TIME FOURIER TRANSFORM PROPERTIES
11			DISCRETE FOURIER TRANSFORM (DFT) • Frequency Domain Sampling • DFT properties • Relationship of DFT to DTFT
12			IIR FILTER DESIGN • Bilinear transformation • Filter design procedure • Butterworth filter design
13			FIR FILTER DESIGN • FIR filter design techniques • Windowing techniques • Filter design procedure
14			Project Presentation
15			Project Presentation
16			Course review for Final Exam, Course/ Instructor Evaluation
17			Final Exam
18			Final Exam

G. ASSESSMENT METHODS AND CRITERIA

Course Grading Policy	***Method***	***Quantity***	***Percentage***
	Attendance		mandatory
	Quizzes	5	5%
	Homework Assignments	5	5%
	Laboratory		
	Seminar / Workshop		

	Project (MATLAB)		10%
	Participation		
	Field Work		
	Midterm Exam	1	20%
	Final / Makeup Exam	1	60%

H. ATTENDANCE / PARTICIPATION

Rules	Classroom attendance is mandatory. Students, who are absent over 30% of the class time automatically fail the course.