STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

ELEC 379 – Digital Signal Processing Applications

Prepared By: David Hartle
Upgraded By: Stephen Frempong

CANINO SCHOOL OF ENGINEERING TECHNOLOGY
ELECTRICAL ENGINEERING TECHNOLOGY & ENGINEERING SCIENCE DEPARTMENT
FALL 2018

A. **TITLE**: Digital Signal Processing Applications

B. **COURSE NUMBER:** ELEC 379

C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 3
 # Lecture Hours: 3 one periods **per week**
 # Lab Hours: **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: No

E. **GER CATEGORY:** NONE

F. **SEMESTER(S) OFFERED:** Fall and Spring

G. **COURSE DESCRIPTION:** This course will introduce the basic concepts and techniques for processing discrete-time signal on a computer using software. Digital Signal Processing (DSP) is concerned with the representation, transformation and manipulation of signals on a computer. DSP has become an important field, and has penetrated a wide range of application systems, such as consumer electronics, digital communications, medical imaging and so on. By the end of this course, the students should be able to understand the most important principles in digital signal processing (DSP). The course emphasizes understanding and implementations of theoretical concepts, methods and algorithms.

H. **PRE-REQUISITES:** MATH162, ENGS102, ELEC165 (or permission by program director)

I. **STUDENT LEARNING OUTCOMES:**

Institutional Student Learning Outcome (ISLO's)
(1) Communication Skills (2) Critical Thinking (3) Foundational Skills
(4) Social Responsibility (5) Industry, Professional, Discipline-Specific Knowledge and Skills.

Accreditation Board for Engineering and Technology ABET- Student Outcomes (a-k)

Course Objective	ABET- Student Outcomes	Institutional SLO's
a. Develop DSP models using equation solving software, and implement analysis in time and frequency domain**.**	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of	2. Crit. Thinking (5) Industry, Professional, Discipline-Specific Knowledge and Skills.

	principles and applied procedures or methodologies.	
b. Illustrate results with graphs and plots, and Apply programming to manipulate discrete signals**.**	(b) An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.	2. Crit. Thinking (5) Industry, Professional, Discipline-Specific Knowledge and Skills.

J. APPLIED LEARNING COMPONENT: CLASSROOM

K. TEXTS:

Ingle, V.K and Proakis, J.G. (2012). *Digital Signal Processing Using MATLAB®, Third Edition.* Cengage Learning.

L. REFERENCES:

M. EQUIPMENT: Computer and software

N. GRADING METHOD: A-F

O. SUGGESTEDMEASUREMENT CRITERIA/METHODS:

- Exams
- Quizzes
- Programs
- Participation

P. DETAILED COURSE OUTLINE:

I. Periodic Signals
   A. Generation of Periodic Signals
   B. Operations with Signals
   C. Harmonics. Fourier
   D. Sampling Frequency

II. Discrete-Time Fourier Analysis
   A. The Discrete-Time Fourier Transform (DTFT)
   B. The Frequency Domain
   C. Sampling and Reconstruction of Analog Signals

III. The z-Transform
   A. Bilateral z-Transform
   B. Inversion of the z-Transform
   C. System Representation in the z-Domain
   D. Solutions of the Difference Equations

IV. The Discrete Fourier Transform
   A. Sampling and Reconstruction in the z-Domain
   B. The Discrete Fourier Transform
   C. Linear Convolution Using the DFT
   D. The Fast Fourier Transform

V. Implementation and Design of Discrete-time Filters
   A. IIR Filter Structures
   B. FIR Filer Structures
   C. Lattice Filter Structures

VI. Sampling Rate Conversion
   A. Decimation by a Factor D
   B. Interpolation by a Factor I
   C. Sampling Rate Conversion by a Rational Factor I/D
   D. Filter Designs and Structures

VII. Round-Off Effects in Digital Filters
   A. Analysis of A/D Quantization Noise
   B. Round-off Effects in IIR and FIR Digital Filters

VIII. Applications in Adaptive Filtering
   A. Suppression of Narrowband Interference in a Wideband Signal
   B. Adaptive Channel Equalization

IX. Applications in Communications
   A. Pulse-Code Modulation (PCM)
   B. Linear Predictive Coding (LPC) of Speech
   C. Dual-tone Multifrequency (DTMF) Signals
   D. Spread-Spectrum Communications

Q. **LABORATORY OUTLINE:** No Laboratory