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

MASTER SYLLABUS

ELEC 165 Digital Fundamentals & Systems

Updated By: Stephen Frempong

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

ELEC 165 – Digital Fundamentals & Systems

A. TITLE : Digital Fundamentals & Systems

B. COURSE NUMBER: ELEC 165

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

 # Credit Hours: 3 !
 # Lecture Hours: 3 **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

G. COURSE DESCRIPTION: $This course covers topics which include: number systems, operations and codes, logic gates, Boolean algebra and logic simplification, combinational logic analysis, functions of combinational logic, latches, flip-flops, timers, counters and shift registers. Semiconductor memories (Eproms, EEproms, and Proms and Drams, etc.) and Digital to Analog/Analog to Digital Converters are also covered.

H. PRE-REQUISITES: ELEC 101 [Electric Circuits I], ELEC 109 [Electric ! Circuits I lab], or permission of instructor. !

CO-REQUISITES: NONE

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 Objectives	ABET-Student Outcomes (a-k)	ISLO's
1. Recognize various instruments and understand how they are used in measurement and troubleshooting digital circuits and systems. 2. Describe the operation of the different types AD/DA converters.	(a) An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.	(5) Industry, Professional, Discipline Specific Knowledge and Skills. (2) Critical Thinking
3. Simplify expressions by using the laws and rules of Boolean algebra, DeMorgan's theorem, and Karnaugh mapping.	(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.	(5) Industry, Professional, Discipline-Specific Knowledge and Skills. (2) Critical Thinking

J. APPLIED LEARNING COMPONENT: CLASSROOM

K. TEXTS:
Tokheim, Roger L. *Digital Electronics: Principles & Applications*. 8th ed. New York: McGraw-Hill, 2014.

L. REFERENCES: As determined by the instructor.

M. EQUIPMENT: As determined by the instructor.

N. GRADING METHOD: A-F !

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

- Examination performance
- Quizzes
- Design Project

P. DETAILED COURSE OUTLINE:

I. Number Systems, Operations, and Codes
- A. Decimal Numbers
- B. Decimal-to-Binary Conversion
- C. Binary Arithmetic
- D. Hexadecimal Numbers
- E. Octal Numbers and BCD

II. Logic Gates
- A. The Inverter
- B. The OR, NAND and NOR
- C. The Exclusive-OR and Exclusive-NOR gates

III. Boolean Algebra and Logic Simplification
- A. Boolean Operations and Expressions
- B. Laws and Rules of Boolean Algebra
- C. DeMorgan's Theorems
- D. Boolean Analysis of Logic Circuits
- E. Simplification Using Boolean Algebra
- F. Boolean Expression and Truth Tables
- G. The Karnaugh Map

IV. Combinational Logic Analysis
- A. Implementing Combinational Logic
- B. The Universal Property of NAND and NOR gates
- C. Combinational Logic Using NAND and NOR gates
- D. Logic Circuit Operation with Pulse Waveform Inputs

V. Functions of Combinational Logic
- A. Adders
- B. Comparators
- C. Decoders

D. Encoders
E. Code Converters
F. Multiplexers and De-multiplexers
G. Parity Generators/Checkers

VI. Latches and Flip-Flops
A. Latches
B. Flip-Flops

VII. Counters
A. Asynchronous Counters
B. Synchronous Counters
C. Up/Down Synchronous Counters
D. Design of Synchronous Counters
E. Cascaded Counters
F. Shift Counters
G. Counter Decoding
H. Counter Applications

VIII. Solid State Memories
A. Read – Write Memories (RAM)
B. Dynamic Read –Write Memories (DRAM)
C. Read Only Memories (ROM)
D. Programmable Read Only Memories (PROM)
E. Electrical Erasable Programmable Read Only Memories (EEPROM)
F. FLASH Memories

IX. Digital to Analog Converters
A. Binary-Weighted-Input
B. R/2R Types !
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X. Analog to Digital Converters
A. Flash (Simultaneous)
B. Successive-Approximation

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Q. <u>LABORATORY OUTLINE</u>: NONE