Miami Dade College

GENERAL INFORMATION	
Course Prefix/Number: CET2113C	Course Title: **Advanced Digital Circuits**
Number of Credits: 4 credits	
Degree Type	☐ B.A. ☐ B.S. ☐ B.A.S ☒ A.A. ☐ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted/Revised: 4/20/12	Effective Year/Term: 2012-2
☐ New Course Competency ☒ Revised Course Competency	
Course Description (limit to 50 words or less): This is a second level course in digital circuits for students majoring in electronics and related engineering technologies that extends the application of sequential and combinational logic circuits and other digital applications. Students will learn to program, operate, and interface with a micro-computer and its elements. Laboratory fee. (2 hr. lecture; 2 hr. lab)	
Prerequisite(s): CET1110C, and COP2270	Corequisite(s): EET1141C

Competencies:

Competency 1:
The student will demonstrate an understanding of computer memory systems by:

1. Explaining the basic concepts involved in memory addressing and data storage.
2. Interpreting the specific timing requirements given in a manufacturer's data manual for reading or writing to a memory integrated circuit (IC).
3. Discussing the operation and application for the various types of semiconductor memory ICs.
4. Designing circuitry to facilitate memory expansion.
5. Explaining the refresh procedure for dynamic RAMs (read-only memories).
6. Explaining the differences between the various types of magnetic and optical storage.

Competency 2:
The student will demonstrate an understanding of input and output devices by:

1. Performing the basic calculations involved in the analysis of operational amplifier circuits.
2. Explaining the operation of binary-weighted and R.2R digital-to-analog converters.
3. Making the external connections to a digital-to-analog IC to convert a numeric binary string into a proportional analog voltage.
4. Discussing the meaning of the specifications for converting ICs as given in a manufacturer's data manual.
5. Explaining the operation of parallel-encoded, counter ramp, and successive-approximation analog-to-digital converters.
6. Making the external connections to an analog-to-digital converter IC to convert an analog voltage to a corresponding binary string.
7. Discussing the operation of a typical data acquisition system.

Competency 3:
The student will demonstrate an understanding of computer control by:

1. Describing the benefits that microprocessor design has over hard-wired IC logic design.
2. Discussing the functional blocks of a microprocessor-based system having basic input/output (I/O) capability.
3. Describing the function of the address, data, and control buses.
4. Discussing the timing sequence on the three buses required to perform a simple I/O operation.
5. Explaining the role of software program instructions in a microprocessor-based system and how the software program reads data from an input port and writes it to an output port.
6. Discussing the basic function of each of the internal blocks of the 8085A microprocessor.
7. Following the flow of data as they pass through the internal parts of the 8085A microprocessor.
8. Comparing assembly language, machine language, and high-level languages and giving examples of how and when each is used.
9. Discussing the fundamental circuitry and timing sequence for external microprocessor I/O.

Competency 4:
The student will demonstrate an understanding of programmable logic devices and VHSIC hardware description language (VHDL) by:

1. Explaining the uses of programmable logic as it is applied to computing systems.
2. Identifying the various structures and types of programmable logic devices, such as simple PLDs, CPLDs, and FPGAs.
3. Applying entities and architectures in simple digital designs.
4. Explaining how to apply and when to use the basic identifiers, data objects, data types, and attributes of VHDL.
5. Creating combinatorial and synchronous logic in VHDL.
6. Designing State Machines using VHDL.
7. Discussing hierarchy in large designs.
8. Understanding and applying functions and procedures.
9. Synthesizing design implementations in CPLD/FPGA hardware.
10. Optimizing data paths to create faster designs.

Competency 5:
The student will demonstrate an understanding of Digital Integrated Systems by:

1. Explaining the implications of Moore's Law as applied to digital integrated systems.
2. Describing the VLSI Integration process.
3. Applying layout and fabrication techniques to produce Application Specific Integrated Circuits (ASICS).
4. Duplicating a layout for a basic 4-bit microprocessor.
5. Applying behavioral and algorithmic transformations to digital systems.
6. Explaining retiming and clock synthesis in digital systems.
7. Discussing parallelism and pipelining in custom digital systems.