A. Protocol

Course Name: Logic and Switching Theory of the Computer  
Course Number: CSC 216  
Credits: 3  
Prerequisites: MAT 195 Discrete Mathematical Structures with C- or better  

Maximum Class Size (face-to-face): 35  
Maximum Class Size (online): N.A.

B. Objectives of the Course:  
Upon completion of this course the student will be able to:

1) Perform numerical conversions of any base.  
2) Identify and convert various non-weighted codes.  
3) Identify and convert various weighted codes.  
4) Perform binary arithmetic operations.  
5) Identify functional components.  
6) Form combinational networks and expressions.  
7) Construct network diagrams.  
8) Convert between normal and standard Boolean forms.  
9) Identify and apply Boolean connectives.  
10) Apply combinational network analysis and synthesis.  
11) Apply the Karnaugh Map minimization technique.  
12) Apply the Quine-McCluskey minimization technique.  
13) Minimize switching functions with don't care states.  
14) Translate networks into all NAND or all NOR logic.  
15) Create timing diagrams for sequential networks.  
16) Form state transition tables and diagrams.  
17) Perform analysis and synthesis of latches and flip-flops.  
18) Perform analysis and synthesis of sequential networks.  
19) Perform analysis and synthesis of asynchronous networks.  
20) Identify encoders, decoders, transcoders, multiplexers, demultiplexers, ROMs and PLAs.

C. Catalog Description:  
This course provides the student with an in-depth study of the basis of digital computers. Number systems, arithmetic operations, codes, boolean algebra, boolean minimization techniques, state transition tables, and state transition graphs are discussed. Extensive emphasis is placed on the analysis and synthesis of synchronous and asynchronous combinational networks which form digital computers. Pre requisite: MAT 195 Discrete Mathematical Structures with C- or better. Three credits.

D. Outline of the Course:  
1) Numbers
   a. Introduction and Representation of Information  
      i. Representation based on distinguish ability  
      ii. Representation based on application  
      iii. Representation based on arithmetic  
      iv. Representation based on error control  
   b. Integer Base Conversion  
      i. Binary to decimal
ii. Base x to decimal
iii. Decimal to binary
iv. Decimal to base x

c. Fraction Base Conversion
   i. Binary to decimal
   ii. Base x to decimal
   iii. Decimal to binary
   iv. Decimal to base x

d. Notations and Conversions
   i. Hexadecimal and binary
   ii. Octal and binary
   iii. Base y and base x

e. Codes and Conversions
   i. Non-weighted codes
      (1) ASCII
      (2) EBCDIC
      (3) Gray
      (4) Parity
   ii. Weighted codes
      (1) BCD
      (2) 2421
      (3) 642-3
      (4) 2-out-of-5

f. Binary Arithmetic operations
   i. Addition
   ii. Subtraction
   iii. Sign magnitude
   iv. 1’s complement notation
   v. 2’s complement notation

2) Binary Functions
   a. Functional components
      i. Combinational
      ii. Storage
   b. Switching functions
      i. AND
      ii. OR
      iii. INVERTER
      iv. NAND
      v. NOR
      vi. XOR
      vii. XNOR
   c. Combinational networks and expressions
      i. Network diagrams
      ii. Expressions
   d. Switching Algebra
      i. Boolean connectives
      ii. DeMorgan
      iii. Normal form
      iv. Standard form

3) Combinational Networks
   a. Analysis
   b. Synthesis
   c. Translate Networks to all NANDs or all NORs

4) Minimization Techniques
   a. Karnaugh maps
   b. Karnaugh maps and don't cares
   c. Quine-McCluskey
d. Quine-McCluskey and don't cares

5) Combinational Modules
   a. Encoders
   b. Decoders
   c. Transcoders
   d. Multiplexers
   e. Demultiplexers
   f. ROMs
   g. PLAs

6) Synchronous Sequential Networks
   a. Timing diagrams
   b. Latch (Flip Flops)
      i. RS
      ii. Master Slave
      iii. D
      iv. JK
      v. T
   c. Registers
   d. Analysis of sequential networks
      i. State transition tables
      ii. State transition diagrams
   e. Synthesis of sequential networks
      i. Stuck states
      ii. Two level (AND OR) design
      iii. Design using combinational modules
   f. Asynchronous Sequential Networks
      i. Analysis
      ii. Synthesis

E. Teaching Methodology:

1) Traditional Classroom Methodology:
   This course will be taught using the lecture/discussion method and cooperative group
   method during appropriate sections of the course.

2) Online Methodology:
   This course will not be taught online.

F. Text:

G. Assessment Activities:

1) Traditional Classroom Assessment
   The final grade will be determined as a percentage from the following evaluation methods
   with varying weights at the discretion of the instructor:
   a. Examinations
   b. Quizzes
   c. Assignments
   d. Programs
   e. Attendance
   f. Performance

2) Online Assessment
   No online assessments will be given.
Accommodations for Students with Disabilities:

Accommodations for Students with Disabilities

Students with disabilities:

- Reserve the right to decide when to self-identify and when to request accommodations.
- Will register with the Office for Students with Disabilities (OSD) each semester to receive accommodations.
- Might be required to communicate with faculty for accommodations, which specifically involve the faculty.
- Will present the OSD Accommodation Approval Notice to faculty when requesting accommodations that involve the faculty.

Requests for approval for reasonable accommodations should be directed to the Office for Students with Disabilities (OSD). Approved accommodations will be recorded on the OSD Accommodation Approval notice and provided to the student. Students are expected to adhere to OSD procedures for self-identifying, providing documentation and requesting accommodations in a timely manner.

Contact Information:

- Location: Azorsky Hall – Room 105
- Phone: (724) 938-5781
- Fax: (724) 938-4599
- Email: osdmail@calu.edu
- Web Site: http://www.calu.edu/current-students/studentservices/disability/index.htm