LAGUARDIA COMMUNITY COLLEGE
CITY UNIVERSITY OF NEW YORK
MATHEMATICS, ENGINEERING, AND COMPUTER SCIENCE DEPARTMENT

MAC291 – Computer Logic, Design and Implementation I

4 credits; 5 hours (3 lecture, 2 lab)
Prerequisites: ENG099, MAT200

Catalog Description:
This course will teach students how a computer logic statement is converted into a circuit. Using binary notation and Boolean algebra, the student will analyze switching networks of logic gates. The circuits which are mathematically described will then be translated into diagrams and implemented on either logic trainers or circuit simulators.

Instructional Objectives:
1. Familiarize students with the use of binary notation
2. Enable students to use Boolean algebra to represent basic logic propositions
3. Enable students to connect simple Boolean equations with actual wired circuits
4. Introduce students to methods of physically wiring TTL integrated circuits together
5. Enable students to write the general form of the min-term and max-term expansion of a function of *n* variables
6. Introduce students to the use of software simulators for studying logic circuits
7. Enable students to design a minimal two-level network of AND and OR gates to obtain a given function
8. Enable students to implement and test the two-level network using TTL circuits in a software simulator
9. Familiarize students with the function, implementation, and testing of decoders and encoders
10. Enable the students to prepare technical reports on circuit design and analysis

Performance Objectives:
1. Use binary notation
2. Represent basic logic propositions using Boolean algebra
3. Interpret Boolean equations into wiring diagrams
4. Wire integrated circuits together
5. Write the general form of the min-term and max-term expansion of a function of *n* variables
6. Use logic trainers and software simulators
7. Design two-level networks of AND and OR gates to obtain a given function
8. Wire and test the two-level network using TTL circuits in a software simulator
9. Describe the function of decoders and encoders, and be able to wire and test them
10. Draft the technical reports on circuit design and analysis

Textbook:
Floyd, Thomas L., Digital Fundamentals, 11th Edition, Pearson, ISBN: 10-0-13-273796-5.

Evaluation:

Written Tests	45%
Class Work	10%
Project	15%
Final exam	30%
Total	100%

Academic Integrity:
This class will be conducted in compliance with LaGuardia Community College's academic integrity policy.

Attendance:
The maximum number of unexcused absences allowed is 15% of the total class meetings. Unexcused absences beyond this maximum will result in a grade of WU or F.

Comments:
The grading standards listed above and the contents listed in the course outline are both subject to modification by the instructor.

COURSE OUTLINE

Week	Topic
1	Digital and analog quantities, basic logic functions, number systems
2	Introduction to binary arithmetic, arithmetic operations, error codes
3	Boolean operations and expressions, Boolean algebra, truth tables
4	Logic gates, Boolean analysis of logic circuits, Boolean expressions with VHDL
5	Use Boolean algebra to simplify logic circuits, standard SOP expressions and POS expressions
6	DeMorgan's Theorems, simplification of advanced logic circuits
7	Karnaugh maps, 4-variable Karnaugh map SOP/POS minimization
8	5-and 6-variable Karnaugh map minimization, Karnaugh map simplification of advanced logic circuits
9	Basic combinational logic circuits, combinational logic using NAND and NOR gates, combinational logic with VHDL
10	Half and full adders, parallel binary adders, ripple carry and look-ahead carry adders
11	Comparators, decoders, encoders, code converters, multiplexers, demultiplexers, parity generators
12	Pulse waveform operation, review on the methodology of design
13	Final Exam