EDO UNIVERSITY IYAMHO

Department of Computer Engineering

EEE 314 Digital Electronic Circuits

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Lectures: Monday, 8:00 am to 10:00am, D ST, : (+234) 8036770349
Office hours: Tuesday 11am to 1pm, Engineering Office Complex, ground Floor Rm AD 8

General Overview of Lecture: The course gives an insight into the theory and operation of the fundamental building blocks of digital electronics with prominence on transistor-transistor logic (TTL) and complementary metal oxide semiconductor (CMOS) integrated circuit logic families. In order to further understand vividly, the theory behind the course its introduces distinct different between analog and digital system, digital circuits and system, number system and codes, Boolean algebra the basic mathematical tool required to synthesize and analyze a vital class of switching circuits. Simplification of logic expressions using K-maps, the understanding of combinational logic circuits design analysis and synthesis, derivation of algorithms for minimal SOP and POS forms from K-maps. The study of logical properties of flip-flops, which serve as memory devices in sequential switching circuits, the design of counters, adders, subtractors, sequence detectors and related circuits. Implementation of logic functions using decoders, encoder circuits structures. Multiplexers/data selector, circuit structures, Application of multiplexers and demultiplexers/data distributors. On to design comparators arithmetic overflow detection. Design example of a computer arithmetic logic unit and computer aided design of modular systems.

Prerequisite: Students should be acquainted with the requisite knowledge in digital signal processing, basic arithmetic of binary numbers computation, conversion of codes and their applications in digital systems. Basic Knowledge of SET in mathematics will be an added advantage. Also have a basic knowledge of how voltage and current are related to switching circuits and representation of their state levels.

Learning Outcomes: At the end of this course students are expected to:

i. Demonstrates a fundamental understanding of digital components, digital terminology, and systems.
ii. Differential between digital and analog systems.
iii. Understand the concept of conversion between analog to digital signal and vice versa
iv. Convert to and from the following bases decimal, binary, octal, and hexadecimal number systems.
v. Describe the basics of Boolean logic operations.

vi. Calculate logic circuit outputs, explain the operation of logic gates, document truth tables for logic gates
vii. Simplify a logic expressions using K-maps
viii. Derive an algorithm to minimal SOP and POS forms from k-maps.
ix. Design of digital electronic devices using the technology and applications of TTL and CMOS families
x. Explain the operation of flip flops, D-flip-flop, J-K flip-flop and those used as a shift register
xi. Demonstrate the operation of multiplexers, demultiplexers, encoders, decoders and wave generating circuits.
xii. Design of computer arithmetic logic and computer-aided design of modular systems.

Assignments/Assessments: Several kinds of assessments will be adopted. These shall include homework that must be submitted before the next lecture day, term paper, which must be given on group basis to be submitted at a stipulated time. The term paper must be mutual report of mini projects that will be given to a group which will depend on the number of groupings. You are expected to also write at least one continuous assessment before the end of this course. Note all these assessment in this course shall form parts of your final assessment in overall.

Grading: The grading procedures that will be adopted as contained in this module of this course, is as follows: 10% shall be allocated to homework, 10% for term paper, 10% for mid-term continuous assessment and 70% for the final exam. The final exam shall be conducted at the completion of the course.

Relevant Resources

Textbooks: *The textbooks recommended for this module are stated*

Title: *Digital Design*
Author: *M. Morris Mano*
Publisher: *Prentice-Hall 3rd Edition*
ISBN: *10:0130621218*
Year: *2001*

Title: *Digital Logic Circuit Analysis & Design*
Author: *Victor P. Nelson, H. Troy Nagle, J. David Irwin, Bill D. Carroll*
Publisher: *Prentice Hall, Inc*
ISBN: *0-13-463□94-□*
Year: *1995*

Title: *Fundamental of Logic Design*
Author: *Charles .H. Roth Jr. and Larry .L. Kenney*
Publisher: *Cengage Learning 7th Edition*
ISBN: *13:978-1133628477*
Year: *2013*

Courseware: -EEE 314 – Digital Electronic Circuits

The following forms outline the courseware for the course EEE 314- Digital Electronic Circuits. Much of this material is taken from recommended text books.

1. Introduction: Number Systems and Code
   i. Analog versus Digital Systems
   ii. Digital Systems and Switching Circuits
   iii. Number Systems and Conversion
   iv. Binary Arithmetic
   v. Representation of Negative Numbers
      - Addition of 2's complement Numbers
      - Addition of 1's Complement Numbers
   vi. Binary Codes

2. Boolean Algebra
   i. Introduction to Basic operations
   ii. Boolean Expressions and Truth Tables
   iii. Basic Theorems
   iv. Commutative, Associative, and Distributive Laws
   v. Simplification Theorems
   vi. Demorgan's Laws
   vii. Simplification of Logic Expressions using K-maps

3. Karnaugh Maps (K-Maps)
   i. Minimum Forms of Switching Functions
   ii. Two and Three variable K-maps
   iii. Four Variable K-maps
   iv. Determination of Minimum Expressions using Essential Prime Implicants
   v. Derivation of Algorithms for Minimal SOP and POS forms from K-Maps

4. Logic Circuits
   i. Combinational Logic Circuits
   ii. Sequential Logic Circuits

5. Logic Devices
   i. The Technology and Application of TTL Families
   ii. The Technology and Application of CMOS Families
   iii. Signal levels, Mixing and Interfacing of logic devices
   iv. Interference and Noise of Logic Devices

6. Memory Devices (Latches)
   i. Flip-Flops
      - RS Flip-Flops
      - D Flip-Flops
      - J-K Flip-Flops

7. Sequential Logic Design
   i. Counters
   ii. Registers
   iii. Timing Circuits

8. Multiplexers and Decoders Devices
   i. Multiplexers and Demultiplexers
   ii. Decoders and Encoders

9. Implementation of Logic Functions Using
   i. Decoders and Encoders Circuit Structures
   ii. Multiplexers/Data Selectors
   iii. Multiplexer Circuit Structures
   iv. Applications of Multiplexers
   v. Demultiplexers/Data Distributors

10. Arithmetic Circuits
   i. Half Adder/Subtractors
   ii. Full Adder/Subtractors
   iii. Comparators
   iv. Arithmetic Logic Unit.
   v. Computer-Aided Design of Modular Systems.