Course Outline

Program	B.Sc. in Computer Science
Course Code / Title	CS301/SE231 / **Logic Design**
Year / Term	2024 / Winter
Instructor	Bisratie Tesfaye (bisratietesfaye@yahoo.com) (0912656308)
Course Description	This course covers the basics of digital logic circuits and design. Through the basic understanding of Boolean algebra and number systems it introduces students to the fundamentals of combinational logic design and then to sequential circuits. The course is an introductory course on digital design aimed at computer science students with no prior background in electronics or engineering. Students gain sufficient exposure to the predominant design concerns at the digital level to work effectively at hardware/software boundary in large applications. Course goals include: • A qualitative understanding of how digital devices work. • Methods and techniques for digital design at the "component level," covering combinational digital logic and synchronous-sequential systems. • Make students to have an understanding of basic low level computer architecture. • Prepare students for advanced courses in logic, computer architecture, design and low level programming.
Prerequisite	Basic background in Mathematics
Objectives	Upon successful completion of the course, the student could: • Understand the concept of digital and binary systems. • Understand the different logic gates, digital logic families and integrated circuits. • Understand Boolean algebra and map simplification and efficiently manage the simplification of Boolean functions. • Be able to design and analyze combinational logic circuits. • Be able to design and analyze of sequential logic circuits.
Text Book	M. Morris Mano, **Digital Logic & Computer Design**, Prentice Hall, 2016 (***A number of chapters from the text book to be covered.*** The Book is to be provided in soft copy. A hard copy is available in the Library).
Reference	• Floye, **Digital Fundamentals,** McGraw Hill, 2015 • Malvino/Leach, **Digital Principles & Applications,** McGraw Hill, 2010
Assessment Method	• Homework and assignment: 20% • Mid-Semester Exam: 30% • Final Semester Exam: 50%

COURSE CONTENT

1. **Introduction to Digital System**
   - 1.1. Digital Systems and Digital Computers
   - 1.2. Number Systems
   - 1.3. Binary Systems
   - 1.4. Number and Base Conversion
   - 1.5. Binary Arithmetic
   - 1.6. Binary Representation of Signed Numbers
   - 1.7. Binary Codes

2. **Boolean Algebra and Logic Gates**
   - 2.1. Boolean Algebra
   - 2.2. Axioms and Basic Terms of Boolean Algebra
   - 2.3. Boolean Functions
   - 2.4. Digital Logic Gates
   - 2.5. Integrated Circuits

3. **Minimization of Boolean Functions**
   - 3.1. The Map Method
   - 3.2. Don't Care Conditions
   - 3.3. Tabulation Method
   - 3.4. Implementation of Combinational Circuit
     - 3.4.1. NAND Gate Implementation
     - 3.4.2. NOR Gate Implementation

4. **Design Of Practical Combinational Logic Circuits**
   - 4.1. Introduction
   - 4.2. Design Procedure
   - 4.3. Adders/Subtractors
   - 4.4. Decoders/Encoders
   - 4.5. Multiplexers

5. **Sequential Logic**
   - 5.1. Introduction
   - 5.2. Flip-Flops
   - 5.3. Types of flip-Flops
   - 5.4. Triggering of Flip-Flops
   - 5.5. Application of Flip-Flops

6. **Design of Practical Sequential Logic Circuits**
   - 6.1. Design Procedures
   - 6.2. Implementation of Sequential Design
   - 6.3. Counters
   - 6.4. Registers