

Table of content

1. **Introduction to Digital Systems Engineering**
 - Role of digital systems in modern engineering
 - Evolution from analog to digital systems
 - System-level design objectives and constraints
2. **Number Systems and Digital Representation**
 - Binary, octal, hexadecimal systems
 - Signed and unsigned number representation
 - Fixed-point and floating-point formats
 - Error detection in digital data representation
3. **Boolean Algebra and Logic Fundamentals**
 - Basic logic operations and identities
 - Logic simplification techniques
 - Karnaugh maps and minimization methods
 - Implementation of combinational logic functions
4. **Combinational Logic Design**
 - Adders, subtractors, comparators
 - Encoders, decoders, multiplexers, demultiplexers
 - Arithmetic logic circuits
 - Design and optimization of combinational systems
5. **Sequential Logic Systems**
 - Latches and flip-flops
 - Registers and counters
 - Finite state machines
 - Timing issues in sequential circuits
6. **Digital System Components and Subsystems**
 - Memory elements and storage organization
 - Data buses and interconnection structures
 - Input/output interfaces
 - Clocking and synchronization mechanisms
7. **Microprocessors and Embedded Digital Systems**
 - Processor architecture fundamentals
 - Instruction execution and control
 - Interfacing microprocessors with peripherals
 - Embedded system applications
8. **Digital Signal Processing and Data Handling**
 - Sampling and quantization concepts
 - Basic digital filtering principles
 - Data acquisition and digital conversion
 - Signal representation and manipulation
9. **Hardware Description and Design Methodologies**
 - Structured design approaches
 - Introduction to hardware description languages
 - Modular and hierarchical design
 - Verification and testing of digital systems

10. Reliability, Testing, and Fault Diagnosis

- Fault models in digital systems
- Testing strategies and testability
- Error detection and correction methods
- Reliability considerations in system design

11. System Integration and Performance Optimization

- Power, speed, and area trade-offs
- Timing analysis and optimization
- Integration of hardware modules
- Design for scalability and maintainability

12. Applications of Digital Systems Engineering

- Communication systems
- Industrial automation and control
- Consumer electronics
- Computing and real-time embedded applications