

Contents

1. **Introduction to Microprocessors and Microcontrollers**
 - Evolution of digital systems
 - Microprocessor vs. Microcontroller
 - Applications and use cases
2. **Microprocessor Architecture**
 - Central Processing Unit (CPU)
 - Arithmetic Logic Unit (ALU)
 - Registers
 - Data, Address, and Control Buses
3. **Microcontroller Architecture**
 - Memory organization (RAM, ROM, Flash)
 - Input/Output Ports (I/O)
 - Clock systems
 - Timers and Counters
 - Interrupt systems
4. **Instruction Set and Assembly Language Programming**
 - Addressing modes
 - Data transfer instructions
 - Arithmetic and logical operations
 - Program control instructions
5. **Memory Management**
 - Memory hierarchy
 - Cache memory
 - Memory mapping
 - Memory protection
6. **Input/Output Interfaces**
 - Parallel and serial communication
 - UART
 - SPI
 - I²C
7. **Interrupts and Real-Time Processing**
 - Interrupt handling
 - Interrupt priorities
 - Real-time system requirements
8. **Converters and Peripheral Devices**
 - Analog-to-Digital Converter (ADC)
 - Digital-to-Analog Converter (DAC)
 - Sensors and actuators
9. **Embedded Systems Design**
 - Embedded applications
 - Resource optimization
 - Power management
 - Reliability considerations
10. **Advanced Applications**
 - Industrial automation
 - Robotics
 - Internet of Things (IoT)
 - Embedded control systems

