Introduction to embedded system, components, characteristics, applications. Intel 8051/8031 Micro-controller: Features of the 8051/8031 family, block diagram and definitions of the pin of the 8051, I/O port structure, memory organisation: general purpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing,

a typical 8051 micro-controller based system. Instruction Set and Assembly Language Programming: Addressing modes, the 8051 instruction set and typical examples, assembler operation, assembly language format, assembler directives, operation of assemblers and linkers, programming examples.

On-chip Peripheral Devices:I/O ports, operations and uses of port 0, port 1, port 2, port 3, timers: their operations, programming, and applications, serial port: operations and programming, typical applications, serial port interrupt. Interfacing to external memory, keypad, seven-segment LED display, ADC and DAC chips, and input / output port expansion, description and uses of hardware development tools.

MOTOROLA M6811 Micro-controller: Features of the M6811 family, block diagram and definitions of the pin of the M6811, I/O port structure, memory organisation: general purpose RAM, bit addressable RAM, register bank, special function registers, external memory, memory space mapping and decoding, bus control signals timing. Instruction Set and Assembly Language Programming. On-chip peripheral devices and I/O interfacing.

Introduction to PIC microcontroller: general architecture, applications and selection of microcontroller, advantages, low-end, and high performance PIC. Specific PIC microcontrollers: Features, architecture, block diagram, pin configuration, on-chip memory, and peripheral. Instruction set and Assembly language programming. Serial I/O interfacing: I2C, and SPI interfacing and programming. Memory interfacing: external memory interfacing, EEPROM and Flash memory interfacing. Design exercises using development system.