

Expert C Programming (Duration: 1.5 Months)

- Introduction to C Programming
- Keywords ,Operators & Expressions
- Data Types, Variables & Functions
- C Program General Structure
- Standard Input and Output
- Variable classification (Storage Class)
- Memory Organization
- Control Structures & Loops
- Preprocessor directives
- Bit-wise operations
- User defined types
- Arrays & Strings
- Structures & Unions
- Structure Bit Fields
- Data Pointers
- Function Pointers
- File Input and Output
- Dynamic Memory Allocation
- C Programming Compilation Stages
- Build & Run Environment (GNU Tools)
 - Build Command Interface
 - Developing and Testing C Programs

8051 Microcontroller (Duration: 1 Month)

- **8-bit** Processor Core
- Features & Block Diagram
- Detailed Pin Descriptions
- Internal Bus Architecture
- Internal Memory Organization & Special Function Registers (**SFRs**)
- Digital Input & Output
- Timer/Counters
- Serial UART
- External Interrupts
- Power Management
- **Interfaces**
 - User Keys, LEDs & LCD
 - Relays, Stepper & DC Motor Controls
 - RS-232 PC Terminals
- **Software Development Tools**
 - Keil uV4 IDE
 - C51 Compiler Tool Chain
 - Flash Programming

ARM Cortex-M3 (Duration: 1.5 Months)

- **32-bit** Advanced Processor Core
- Features & Block Diagram
- Detailed Pin Descriptions
- Internal Bus Architecture
- Internal Memory Organization
- Nested Vectored Interrupt Controller(NVIC)
- System Tick Timer
- Serial Wire Debug (SWD)
- System Control
- **Device Drivers**
 - General Purpose Input Output(GPIO)
 - 16-bit Timers (Capture & Match)
 - 32-bit Timers (Capture & Match)
 - Pulse Width Modulation (PWM)
 - Analog to Digital Converter (ADC)
 - Digital to Analog Converter (DAC)
 - Real Time Clock (RTC)
 - Watchdog Timer (WDT)
- **Serial Protocols**
 - Universal Asynchronous Receiver Transmitter (UART)
 - Inter Integrated Circuit (I2C)
 - Serial Peripheral Interface (SPI)
 - Universal Serial Bus (USB)
 - Controller Area Network (CAN)
- **External Interface Modules**
 - User Keys, LEDs & LCD
 - Multiple Sensors & EEPROM
 - GSM & GPS
 - RS-232 PC Terminals
- **Software Development Tools**
 - Keil uV4 IDE
 - ARMCC Compiler Tool Chain
 - MICROBIT ARM Cortex-M Development Board
 - Flash Programming
 - JTAG Debugging

Real Time Operating System (RTOS) (Duration: 0.5 Months)

- **Kernel Features**
 - Time Slice Round Robin Task Scheduling
 - Priority Pre-Emptive Task Scheduling
 - Task Synchronization
 - Inter Task Communication
 - Mutual Exclusion
- **Task Management**
 - Task Control Block (**TCB**)
 - Task State Transition
- **Kernel Services**
 - Task Creation
 - Time Slice Setup
 - Task Sleep
 - Task Synchronization
 - ✓ Event Flags
 - ✓ Binary Semaphores
 - Mutual Exclusion (**MUTEX**)
 - ✓ Priority Inversion
 - ✓ Priority Inheritance
 - ✓ Priority Ceiling
 - Inter Task Communication
 - ✓ Message Queues
 - Interrupt Handling
 - ✓ System **ISRs**
 - ✓ User Defined **ISRs**

Embedded Linux (Duration: 1.5 Months)

- **Linux Overview**
 - Introduction to **LINUX** Operating System
 - File System Structure
 - Linux File and Directory Management
 - Linux Command Interface
- **Application Development**
 - **LINUX** Kernel Overview
 - User Space and Kernel Space
 - Input & Output in Linux

- System Call Interface
- Processes & Threads
- **Inter Process Communication (IPC)**
 - ✓ Shared Memory
 - ✓ FIFOs
 - ✓ Message Queues
 - ✓ Pipes
- **Process/ Thread Synchronization**
 - ✓ Signals
 - ✓ Semaphores
 - ✓ Mutex Locks
- Memory Management
- Time & Timer handling
- **TCP/IP** Stack & BSD N/w Sockets
- **Beagle Bone Black Overview**
 - TI AM335x 1GHZ ARM Cortex-A8 Processor
 - 512MB DDR3 RAM, 2GB eMMC On-Board Flash and microSD
 - USB Host
 - USB Client
 - UART
 - Ethernet
 - HDMI
 - I2C EEPROM
- **eLINUX Distribution**
 - **U-Boot** Bootloader
 - eLinux Kernel Sources
 - ARM Linux GNU Tool Chain (arm-linux-gnueabi)
 - Porting Linux on Beagle Bone Black
- **eLinux Cross Development Platform**
 - Eclipse CDT Integrated Development Environment (IDE)
 - Remote System Environment (RSE)
 - Host Target Architecture
 - Application Deployment
 - Remote Target Debugging
 - ✓ gdb server
 - ✓ multi-arch