

Embedded System Programming - Course Content		
Total duration: 2 months (8 weeks) followed by flexible 1 month of project. Each week 6 hours classes (3 days and 2 hours/day OR 2 days and 3 hours/day). Classes on Monday, Wednesday and Friday evenings.		
<u>Introduction</u> This training program has been designed to provide a thorough understanding of Embedded Systems basics and principles using 8051 based 8-bit microcontrollers. It tackles all the basic components of Embedded Systems in isolation and also creates an understanding on how to integrate these components, to design and develop a complete system. The final project done by the trainees will ensure that they have understood the complete picture when it comes to 8051 microcontroller and also have sufficient knowledge to understand and work on any other system based on 8-, 16- or 32- bit based processors/controllers.		
<u>Target audience for the program</u> This program is targeted at Undergraduate Engineering Students as well as those who have completed their degree. This program can also be attended by interested students of MCA and PG Engineering streams.		
<u>Prerequisites/Knowledge required to attend this program</u> - Exposure to programming, in any language - C programming - basic level		
<u>Areas to be covered in this program</u> - C Programming - Introduction to Embedded Systems - 8051 Architecture and C51 Assembly Language Programming - Embedded C - Design of Embedded Systems - Mini Project using the hardware kit		
	Content	Duration
1	C and Embedded C	2 weeks
	Foundations of C programming	
	Types, declarations and expressions	
	Control Flow, Functions and program structure	
	Arrays, pointers, structures	
	Input and output handling	
	Dynamic Memory Management	
	Linked Lists	
	Command-line argument handling	
	Stacks and queues	
	Program Design	
2	Introduction to Embedded Systems	1 week
	What is Embedded System?	
	Standard component of Embedded Systems - Processor, Memory, I/O, Peripherals, Software, Algorithms	
	Processor types - Microcontrollers, Microprocessors, DSP, FPGA	
	Memory types - RAM, SRAM, DRAM, DDRAM, EPROM, EEPROM, OTP	
	Peripherals - Parallel and Serial Ports, UART, Timers, Real time clocks, I2C bus, DMA controllers	
	Analogue Interfaces - A-D and D-A conversion, CODECs	
	Interrupts and Interrupt handling	
3	8051 Architecture and C51 Assembly Language Programming	3 weeks
	8051 Architecture - Oscillator, Clock, Internal memory and RAM, SFRs, Internal ROM, I/O pins and ports	
	External memory, Counters and Timers, Serial Data I/O, Interrupts	
	Assembly language instructions	
	Data operations, logical operations, arithmetic operations, Program control	
	Configuration and programming of 8051 Ports, Timers and Interrupts	
	Interfacing 8051 with LEDs, Keypad and 7-Segment Display and programming	
	Interfacing with LCD and programming	
	Interfacing with ADC and programming	
	Serial Data Communication programming	
4	Embedded C	1 week
	Embedded Software development using C	
	Porting 8051 Assembly code to C	
	Cross compilation, Downloading, Testing, Debugging	

5	Design of Embedded Systems	1 week
	Problem definition, requirements and specifications	
	Software planning - Hardware design and software design	
6	Mini Project -	1 month
	Flexible timings for the project work	
	To be done on the hardware kit or else you can design your own hardware on breadboard or GP board	
	Design challenge would cover most of the concepts learned in the training period	