

Embedded Power Electronics For Industrial Applications Course Content

MODULE: 1 PROGRAMMING

DURATION: 120 Hours

C & C++ WITH DATA STRUCTURES

- Introduction to C & Data types, Operators
- Control Flow, Modular Programming, Inline Functions, Atomic Statement,
- Storage classes, Reentrance, Arrays & Strings - Character Arrays, Memory Allocation
- Unions, Structures, Pointers & Functions Pointers & Usage
- Hands-on tasks on C (Seed/Key), Bit Fields
- Portability issues in C, Hardware, Time, Space and Power-aware Programming,
- Debugging and Optimization of C programs
- Command Line Arguments & Files I/O, Block I/O, Random Access – f seek, f tell, rewind
- Debugging and Optimization of C programs
- Data structures Basics, Stack and Queues
- Linked list, Data structures Basics, Stack and Queues, Sorting Algorithms

OOPS WITH C++

- Introduction to Oops and C++
- Procedural Approach in C++
- Function Overloading & Name Mangling
- Object-oriented Approach in C++
- Operator overloading
- Constructors & Destructors
- Static and constants
- Friend: Function and class
- Inheritance and “is a ” relationship
- Run time polymorphism
- Exception handling & Multi-Threading

MODULE: 2 EMBEDDED MICROCONTROLLERS

DURATION: 120 Hours

- Basics of Embedded Systems
- Assemblers, Compilers, Linkers
- Loaders & Debuggers
- Build, Test & GNU Tools
- Code Startups, Interrupts
- Introduction to Different Micro Controllers
- Architectures and Memory
- Communication Protocols- CAN, CANFD, SPI, I2C
- Timers / Counters, ADC, UART, SPI, PWM, WDT(Configuration)
- Input/Outputs
- Memory Model, Exception Handling

- Peripheral Programming
- Single Core/Multicore Micro Controllers
- Latest Micro Controllers Introduction 16/32 Bit (Renesas, Infineon)
- Basics HW Design
 - Circuit Design & Schematic Designs
 - Component Library and Standards

MODULE: 3 POWER ELECTRONICS AND DRIVES

DURATION: 50 Hours

- Basics of Devices SCR, IGBT, MOSFET.
- Single-phase AC/DC Converters.
- Three-phase AC/DC Converters.
- DC-DC Converters
- DC-AC Converters
- DC Drives
- AC Drives (Induction Motor and PMSM Motor Drives)

MODULE: 4 MODEL-BASED DEVELOPMENT USING MATLAB/SIMULINK

DURATION: 50 Hours

- Dspace target links blocks.
- Code generation for the logic Development.
- State Flow and State transition diagrams.
- MIL, SIL and PIL Testing.
- MAAB Guidelines, MXAM

MODULE: 5 H/W TESTING USING DSP-F28379D WITH SIMULINK INTERFACE

DURATION: 40 Hours

- DC-DC Converters
 - a) Non - Isolated Converters.
 - b) Isolated Converters.
- DC-AC Converters
 - a) 1-phase and 3 phase PWM Inverters.
 - b) FOC Control of Induction Motor and PMSM Motor for EV Applications.
 - c) Phase shifted Full bridge DC-DC converter.
 - d) LLC Converter for Battery Charging.