

# Microcontroller Programming and Interfacing Syllabus

1. Overview of Microcontrollers
2. Microprocessors and SoC, RISC vs CISC, Harvard vs Princeton Architectures
3. Overview of Computer Architecture
4. Embedded Memories
5. Timers/Counters, Input Capture, Output Compare Modes
6. LED, Switches, ADC, DAC, LCD, RTC
7. UART, SPI, PWM, WDT, I2C, CAN
8. Bus Standards (USB, PCI)
9. Programming in Assembly & Embedded C

## 10. ARM

- Overview of ARM Architecture and Organization
- Introduction to Cortex-M Architecture
- Programming Model and Instruction Set Architecture
- Alignment and Endianness, Register access,
- States and Privileges
- Stack, System Control Block, Power Modes
- Memory Model
- NVIC, Exception Handling
- Bit-Banding, Peripheral Programming
- SVCALL, SysTick, PendSV,
- MPU, DMA
- Mixing Assembly and C programs
- Introduction to CMSIS & CMSIS Components
- Overview of Cortex A & R architectures

## 11. RISC V

- Why RISC-V processor, RISC-V processor overview
- ARM vs RISC-V
- Modes in RISC-V
- Setting up of necessary tools
- RISC-V register set and calling convention
- Instruction formats and type
- Build Process
- Practical examples of instructions
- Detail description on Control and Status Registers
- Exception handling
- Examples in assembly for exception handling.
- Interrupts
- Interrupt Entry and Exit procedure
- Introduction to C-DAC VEGA processors

## Textbooks

- The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors, Third Edition, Joseph Yiu
- Computer Organization and Design RISC-V Edition: The Hardware Software Interface, David A. Patterson, John L. Hennessy