Module 1

Syllabus : Definition, Characteristics, Classification, Applications. Design metrics of Embedded system and Challenges in optimization of metrics.

Module 2

Syllabus : Features of Embedded cores- µC, ASIC, ASSP, SoC, FPGA, RISC and CISC cores. Types of memories. Case Study: ARM Cortex-M3 Features, Architecture, Programmer's model, Special Registers, Operating Modes and States, MPU, Memory map and NVIC. Low power - Need and techniques. Case study of Low Power modes in

Cortex-M3. Communication Interfaces: Comparative study of Serial communication Interfaces -RS-232, RS-485, SPI, I2C, CAN, USB (v2.0), Bluetooth, Zig-Bee. (Frame formats of above protocols are not expected). Selection Criteria of Sensors and Actuators

Module 3

Syllabus : Program Modelling concepts: DFG, CDFG, FSM. Real-time Operating system: Need of RTOS in Embedded system software and comparison with GPOS. Task, Task states, Multi-tasking, Task scheduling, and

algorithms-Preemptive SJF, Round-Robin, Priority, Rate Monotonic Scheduling, Earliest Deadline First Inter-process communication: Message queues, Mailbox, Event timers. Task synchronization: Need, Issues- Deadlock, Race condition, live Lock, Solutions using Mutex, Semaphores. Shared Data problem, Priority inversion

Module 4

Chapter 4 : Introduction to FreeRTOS 4-1 to 4-8

Syllabus : FreeRTOS Task Management features, Resource Management features, Task Synchronization features, Event Management features, Calculation of CPU Utilization of an RTOS, Interrupt Management features, Time Management features.

Module 5

Chapter 5 : Testing and Debugging Methodology 5-1 to 5-28

Syllabus : Testing & Debugging : Hardware testing tools, Boundary-scan/JTAG interface concepts, Emulator. Software Testing tools, Simulator, Debugger. White-Box and Black-Box testing.

Module 6

Chapter 6 : System Integration (Case Studies) 6-1 to 6-17

Syllabus : Embedded Product Design Life-Cycle (EDLC)- Waterfall Model. Hardware-Software Co-design. Case studies for Automatic Chocolate Vending Machine, Washing Machine, Smart Card, highlighting : (i) Specification requirements (choice of components), (ii) Hardware architecture (iii) Software architecture.

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