

# Embedded System

B.E. Sem. VIII [CMPN]

(Elective – II)

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## EVALUATION SYSTEM

	Time	Marks
<b>Theory Exam</b>	3 Hrs.	100
<b>Oral Exam</b>	–	25
<b>Term Work</b>	–	25

## SYLLABUS

### 1. Introduction to Embedded Systems

Review of microcontrollers and Digital Signal Processors (DSP), architecture, peripheral modules. Embedded micro controller cores (ARM, RISC, CISC, SOC), addressing modes, interrupts structure, hardware multiplier, pipe lining. Hardware/Software co-design. Architecture of embedded systems.

### 2. Embedded Software Development

Assemblers, linkers and loaders. Binary file formats for processor executable files. Typical structure of timer-interrupt driven programs. GNU-GCC compiler introduction, programming with Linux environment and gnu debugging, gnu insight with step level trace debugging, make file interaction, building and execution.

### 3. Design with ARM Processor

Introduction to ARM instruction set, addressing modes, operating modes with ARM core, ARMTDMI modes, ADC, Timers, Interrupt structure. Byte ordering (LE, BE), Thumb mode normal mode instructions changes, Pipeline utilization with all register allocations. Compare with ARM7, ARM9, and ARM11 with new features additions. System design with ARM processor.

### 4. Input / Output Interfacing

Interfacing with switches, keyboards, LED's, LCD's, transistors used for digital- controlled current switches, digital-controlled relays, solenoids, DC, AC and stepper motors, analog interfacing and data acquisition systems.

### 5. Real-time Operating System

Real Time Operating System Concepts, Kernel Structure, Critical Sections, Multitasking, Task Management, Time Management, Schedulers, Event Control Blocks, Priorities, Deadlocks, Synchronization, Semaphore Management, Mutual Exclusion, Message Mailbox Management, Message Queue Management, Memory Management, RTOS implementation. Examples of OSs for embedded systems - RT Linux, uC/OS.

### 6. Applications of Embedded Systems

Database applications; Image processing, Process-control, Robotics, Automation, Security and communication.

## Reference Books

1. Embedded / Real-Time Systems: Concepts, Design & Programming – (Dr. K. V. K. K. Prasad) – dreamtech Press, India.
2. An Embedded Software Primer – (David E. Simon) – Pearson Education South Asia.
3. Embedded Microcomputer Systems Real Time Interfacing – (Jonathan W. Valvano) – Thomson Asia Pte Ltd.
4. ARM System Developer’s Guide Designing and Optimizing System Software – (Andrew N. Sloss, Dominic Sysmes and Chris Wright) – Elsevier Inc.
5. Embedded Systems, Architecture, Programming and Design – (Raj Kamal) – Tata McGraw Hill.
6. Embedded Linux – (Hollabaugh), Pearson Education.
7. Embedded Realtime Systems Programming – (Sriram V Iyer, Pankaj Gupta) – Tata McGraw Hill.
8. Fundamentals of Microcontrollers and Applications in Embedded Systems – (Ramesh Gaonkar) – Penram International Publishing (India) Pvt. Ltd.

