NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
M. Tech. in Electronics & Communication Engineering (Embedded System)
M.Tech Semester - I

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Course Code	6EC202CC22
Course Title	Processor Architecture and Design

Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. Comprehend architecture of modern processer/controller and bus protocols for embedded system.
2. Appraise the concept of the instruction and thread level parallelism,
3. Analyze the performance of symmetric and distributed shared memory based multiprocessors.

Syllabus: **Teaching Hours:45**

UNIT I: Processor Architecture Fundamentals **04**
Classification of Processor Architectures, Instruction set principles, Memory Hierarchy Design, Measuring and Reporting performance

UNIT II: Instruction level parallelism **12**
Pipeline concept, Classification of Pipeline Processors, Instruction flow and Register data flow techniques, Compiler Techniques to exploit Instruction level parallelism

UNIT III: Multiprocessors and Thread-Level Parallelism **10**
Symmetric Shared-Memory Architectures, Performance of Symmetric Shared-Memory Multiprocessors, Distributed Shared Memory and Directory-Based Coherence, Thread level parallelism

UNIT IV: ARM Microcontroller architecture **10**
Block Diagram, Features, Memory Mapping Memory Controller (MC), Memory Controller Block Diagram, Address Decoder, External Memory Areas, Internal Memory Mapping, External Bus Interface (EBI), Organization of the External Bus Interface, EBI Connections to Memory Devices, External Memory Interface, Write Access, Read Access, Wait State Management, , Memory Management Units, details of the ARM MMU, ARM Instruction Set, Thumb Instruction Set and Interrupt

UNIT V: Bus Standards **05**
SPI, I2C, CAN, USB, PCI, PCIe.

UNIT VI: Case Study **04**
ARM Processors - OMAP, TI MSP-430 RISC/ARM Design Philosophy, ARM CORTEX Architecture

Self Study:
The self study contents will be declared at the commencement of semester. Around 10% of the question will be asked from self study contents.

Suggested Readings:

1. John L. Hennessy, David A. Patterson, Computer Architecture: A Quantitative Approach, Stanford University, Elsevier
2. John Paul Shen and Mikko H. Lipasti, Modern processor Design Fundamentals of Superscalar Processors, TMH.
3. Behrooz Parahami, Computer Architecture from Microprocessor to Super Computer, Oxford.
4. Steve Furber, ARM System- On- Chip Architecture, Pearson Education Asia
5. Andrew N Sloss, Dominic Symes, Chris Wright, ARM System Developer's Guide - Designing and Optimizing System Software, Elsevier