

K L University
Department of Electronics & Computer Engineering
M.Tech (Embedded Systems)

Course No. : 15-EM52D2
Course Title : SOC Design and Verification
Course Structure : 3-0-0

UNIT – I

Motivation for SoC Design - Review of Moore's law and CMOS scaling, benefits of system-on-chip integration in terms of cost, power, and performance, Comparison of System-on-Board, System-on-Chip, and System-in-Package, Typical goals in SoC design – cost reduction, power reduction, design effort reduction, performance maximization.

UNIT – II

System on chip design process: A canonical SoC Design, SoC Design flow waterfall vs. spiral, top down vs. Bottom up. Specification requirement, Types of Specification, System Design process, System level design issues, Soft IP Vs Hard IP, hardware-software co-design, Design for timing closure, Logic design issues Verification strategy, On chip buses and interfaces.

VLSI System Testing & Verification: Introduction, A walk through the Test Process, Reliability, Logic Verification Principles, Silicon Debug Principles, Manufacturing Test Principles, Design for Testability, Boundary Scan

UNIT – III

Embedded Memories – cache memories, flash memories, embedded DRAM, cache memories, Cache coherence, MESI protocol and Directory-based coherence.

UNIT – IV

Interconnect Architectures for SoC – Bus architecture and its limitations, Network on Chip (NOC) topologies, Mesh-based NoC, Routing in an NoC, Packet switching and wormhole routing.

UNIT – V

MP SoCs: What, Why, How MP SoCs. Techniques for designing MP SoCs, Performance and flexibility for MP SoCs design

Case study: A Low Power Open Multimedia Application Platform for 3G Wireless 21

Test Books:

1. Sudeep Pasricha and Nikil Dutt, "On-Chip Communication Architectures: System on Chip Interconnect", Morgan Kaufmann Publishers, 2008.
2. Rao R. Tummala, Madhavan Swaminathan, "Introduction to system on package sop-Miniaturization of the Entire System", McGraw-Hill-2008.
3. James K. Peckol, "Embedded Systems: A Contemporary Design Tool", Wiley Student Edition, 2008.
4. Michael Keating, Pierre Bricaud, "Reuse Methodology manual for System on chip designs", Kluwer Academic Publishers, 2nd edition, 2008.

References:

1. Ahmed Amine Jeraya, Wayne Wolf, "Multiprocessor System On Chip", Morgan Kauffmann, 2005.
2. Sung- Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits", Tata Mcgraw-hill, 3rd Edition, 1996.
3. Neil H.E. Weste, David Harris, "CMOS VLSI Design: A Circuits and System Perspectives" Addison Wesley - Pearson Education, 3rd Edition, 2004.
4. Henry Chang, Larry Cooke, Merrill Hunt, Grant Martin, Andrew McNelly, Lee Todd, "Surviving the SoC Revolution: A guide to platform-based design", Springer, 2000.