

Low Power VLSI Circuits & Systems - Video course

COURSE OUTLINE

Basics of MOS circuits:

- MOS Transistor structure and device modeling
- MOS Inverters
- MOS Combinational Circuits - Different Logic Families

Sources of Power dissipation:

- Dynamic Power Dissipation
 - Short Circuit Power
 - Switching Power
 - Glitching Power
- Static Power Dissipation
- Degrees of Freedom

Supply Voltage Scaling Approaches:

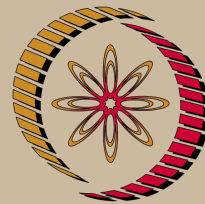
- Device feature size scaling
- Multi-V_{dd} Circuits
- Architectural level approaches: Parallelism, Pipelining
- Voltage scaling using high-level transformations
- Dynamic voltage scaling
- Power Management

Switched Capacitance Minimization Approaches:

- Hardware Software Tradeoff
- Bus Encoding
- Two's complement Vs Sign Magnitude
- Architectural optimization
- Clock Gating
- Logic styles

Leakage Power minimization Approaches:

- Variable-threshold-voltage CMOS (VTCMOS) approach
- Multi-threshold-voltage CMOS (MTCMOS) approach
- Power gating
- Transistor stacking
- Dual-V_t assignment approach (DTCMOS)



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Computer Science
and Engineering

Pre-requisites:

Digital circuits.

Coordinators:

Prof. Ajit PalDepartment of Computer Science and
Engineering IIT Kharagpur

Special Topics:

- Adiabatic Switching Circuits
- Battery-aware Synthesis
- Variation tolerant design
- CAD tools for low power synthesis

COURSE DETAIL

| Module No. | Topics | No.of Hours |
|------------|--|-------------|
| 1 | Basics of MOS circuits | 10 |
| 2 | Sources of Power dissipation | 6 |
| 3 | Supply Voltage Scaling Approaches | 6 |
| 4 | Switched Capacitance Minimization Approaches | 6 |
| 5 | Leakage Power minimization Approaches | 6 |
| 6 | Special Topics | 6 |

References:**Text**

1. Sung Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, Tata Mcgrag Hill.
2. Neil H. E. Weste and K. Eshraghian, Principles of CMOS VLSI Design, 2nd Edition, Addison Wesley (Indian reprint).
3. A. Bellamour, and M. I. Elmasri, Low Power VLSI CMOS Circuit Design, Kluwer Academic Press, 1995.
4. Anantha P. Chandrakasan and Robert W. Brodersen, Low Power Digital CMOS Design, Kluwer Academic Publishers, 1995.

Reference

1. Kaushik Roy and Sharat C. Prasad, Low-Power CMOS VLSI Design, Wiley-Interscience, 2000.