

### Low Power VLSI Design

<b>CourseCode</b>	23EC4701A	<b>Year</b>	IV	<b>Semester</b>	I
<b>Course Category</b>	PE-IV	<b>Branch</b>	ECE	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Prerequisites</b>	VLSI Design
<b>ContinuousInternal Evaluation</b>	30	<b>Semester End Evaluation</b>	70	<b>Total Marks</b>	100

---

Course Outcomes		
Upon successful completion of the course, the student will be able to		BL
<b>CO1</b>	Understand the need of Low power circuit design	L2
<b>CO2</b>	Attain the knowledge of architectural approaches	L2
<b>CO3</b>	Analyze and design Low-Voltage Low-Power combinational circuits	L4
<b>CO4</b>	Design of Low-Voltage Low-Power Memories	L3

---

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3-High, 2: Medium, 1:Low)													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
<b>CO1</b>	2				2							2	
<b>CO2</b>	2				2							2	
<b>CO3</b>	2	3	3		2							2	
<b>CO4</b>	2	3	3		2							2	
<b>Avg.</b>	2	3	3		2							2	

Syllabus		
UnitNo.	Contents	Mapped CO
1	Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects – Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect	CO1
2	Low-Power Design Approaches: Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach – Pipelining and Parallel Processing Approaches.	CO2
3	Low-Voltage Low-Power Adders: CMOS Adder's, Architectures – Ripple Carry Adders, Carry Look- Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage	CO3
4	Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh- Wooley Multiplier, Booth Multiplier	CO3
5	Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Pre-charge operation, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh operation	CO4

<b>Learning Resources</b>
<b>Text Books</b>
1. Sung-Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits – Analysis and Design –TMH, 2011. 2. Kiat-Seng Yeo, Kaushik Roy, Low-Voltage, Low-Power VLSI Subsystems –TMH Professional Engineering.
<b>Reference Books</b>
1. Ming-BO Lin, Introduction to VLSI Systems: A Logic, Circuit and System Perspective –CRC Press, 2011 2. Gary K. Yeap, Practical Low Power Digital VLSI Design –Kluwer Academic Press,
<b>e- Resources &amp; other digital material</b>
1. <a href="https://nptel.ac.in/courses/106105034">https://nptel.ac.in/courses/106105034</a>