

SYLLABUS FOR CUSTOM LAYOUT DESIGN

Essentials of UNIX/Linux

- Linux/UNIX OS, Shell
- Working with files, directories
- Commonly used commands

Semiconductor Basics

- Conductor, Semiconductor & Insulators =(Intrinsic& Extrinsic) Semiconductor.
- Basic Passive and Active devices.
- Ohms law, Kirchoff laws
- Basic of circuit understanding

CMOS & FINFET Basics

- MOSFET Basics, Operations, few simple circuits & second order effects.
- MOSFET Detailed fabrication process.
- FinFET working, Fabrication, advantages & disadvantages.

Layout tool

- Layout Editor Tool
- Understanding the schematic symbols and parameters
- Creating and managing libraries and cell
- Commands for Layout editing.
- Commands for schematic editing.
- Verification : DRC and LVS
- Antenna effect, latchup, Electromigration, IR Drop
- Analog Layout of OpAmp, Current Mirror, PLL, ADC, and DAC
- Resistor, Capacitor layout techniques
- CMOS and BiCMOS layout techniques
- Standard Cell Layout : Inverter, AND, OR, NAND, NOR, AOI, OAI, Latches, and Flop

Advanced Layout Concepts

- Mismatches & Matching.
- Failure Mechanism : Electro migration, IR drop, LOD & Stress effects, WPE, Antenna Effects, Latch up, ESD (with High voltage rules, EOS effects).
- Noises & Coupling.
- Different Types of process – Advantages & Disadvantages – Planar CMOS, FD-SOI, SOI, Bi-CMOS, Gallium Arsenide, Silicon-Germanium, Finfet.
- Full Chip Construction, Scribe Seal, Pad Frame, Integration and guidelines.
- Packaging.

Standard cell, IO, and Memory Layout

- Std Cell & Memories.
- IO Layout Guidelines : High speed IOs and High Speed Interfaces.
- Sense amplifier & Bit cell development
- Why memory layout different than analog layout
- Memory layout flow
- Types of memory layout (SRAM/DRAM/ROM)
- Introduction to SRAM memory layout
- Fixing few manually created leaf-cell errors which impact

- Impact of IR, EM and DFM
- SRAM memory design architecture
- Words line and address line
- SRAM rows and column design
- Building blocks of SRAM
- Memory Bit cell
- Row decoder
- Word line driver
- Sense amplifier
- Control block
- Misc digital logic.
- Pitch Calculation for blocks.
- Power Planning

Analog and Mixed signal Layout

- High speed Analog Layout
- RF Layout guidelines with Transmission lines and inductor concepts
- Handling clocks
- Analog Circuits & Layout guidelines
- Single & Multi stage differential opamp layout
- current mirror layout
- PLL, DLL and Oscillators
- LDO and other regulators
- ADCs & DACs
- Bandgap, Temperature sensors & Biases -> Current & Voltage bias lines
- input pair, differential routing, Power routing, offset minimizing
- Power/Signal IR Drop
- cross-talk and coupling
- Electrostatic Discharge
- Deep Submicron Layout Issues
- Shallow Trench Isolation (LOD)
- Well Proximity Effect.

Assignments and hands on projects

- Assignments and multiple hands on projects
 - Best Practices & Interview Questions.
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