WANT TO ENTER INTO VLSI DOMAIN

TYPES OF VLSI / SEMICONDUCTOR COMPANIES

EDA

- Development of tools and provide support of that tools.
- Synopsys, cadence, mentor, etc

DESIGN BASED

- Designing a chip.
- Intel, Qualcomm, NXP, etc.

FOUNDRY

- IC manufacturing and fabrication.
- TSMC, Samsung and Global Foundry, etc.

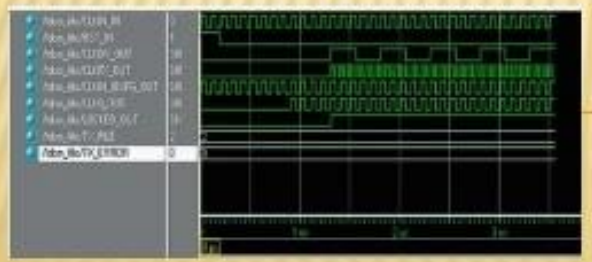
VLSI

Front end

Designing & Testing Part

Uses VHDL, verilog and

Other HDL's



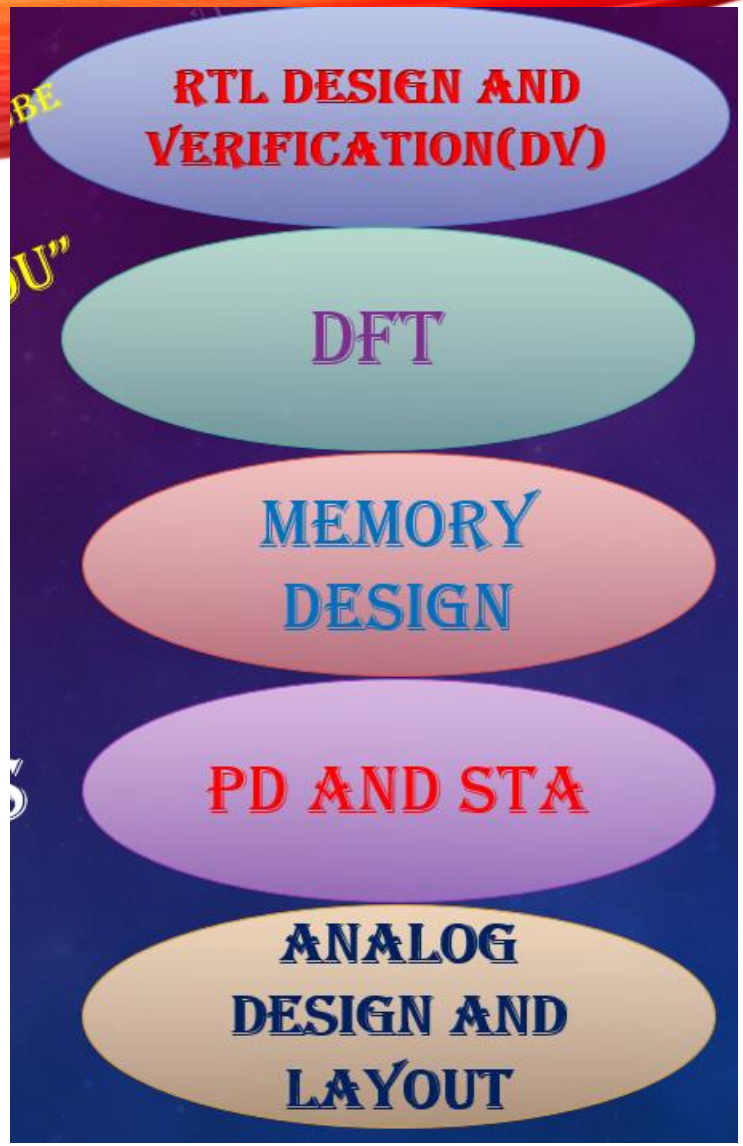
Back end

Development & Fabrication Part

Too costly and time

consuming process

nsdobal@gmail.com



Frontend

- RTL Design Engineer
- IP/SOC Design Engineer
- RTL Integration Engineer
- ASIC/IP/SOC Verification Engineer
- Pre Silicon Validation Engineer
- FPGA Design/Prototyping Engineer
- Emulation Engineer
- DFT Engineer
- Formal Verification Engineer
- Post Silicon Validation Engineer

Backend

- Physical Design Engineer
- Synthesis and STA Engineer
- Physical Verification Engineer
- Layout Design Engineer
- Analog and Mixed Signal Circuit Design Engineer

SKILLS REQUIRED

- There are different topics requires to learn for different profiles.

- Some common topics which are required for everyu vlsi profile are as follows

DIGITAL ELECTRONICS

ANALOG ELECTRONICS

VERILOG/VHDL

APTITUDE

LINUX/UNIX

CMOS FABRICATION

BASIC C/C++ PROGRAMMING

CMOS VLSI DESIGN

RTL DESIGN AND VERIFICATION PROFILE

GOOD UNDERSTANDING ON :

- **ASIC DESIGN FLOW**
- **VERILOG HDL/ VHDL**
- **BASICS ON SYSTEM VERILOG**
- **BULIDING VERIFICATION ENVIRONMENT BY USING METHADOLOGIES LIKE UVM**
- **PROTOCOLS LIKE APB, AHB, UART, I2C ETC**
- **HANDS ON EXPERIENCE ON LINUX/UNIX TOOLS**

DFT PROFILE

GOOD UNDERSTANDING ON :

- **ASIC DESIGN FLOW**
- **VERILOG HDL/ VHDL**
- **SCRIPTING LANGUAGES LIKE TCL , PERL**
- **DFT RELATED TOPICS LIKE FAULT MODELS, FAULT COVERAGE , SCAN CHAIN INSERTION ATGP TOOL ETC**
- **HANDS ON EXPERIENCE ON LINUX/UNIX TOOLS**

PD (PHYSICAL DESIGN), STA, PV(PHYSICAL VERIFICATION)

GOOD UNDERSTANDING ON :

- **ASIC DESIGN FLOW**
- **SCRIPTING LANGUAGES LIKE TCL , PERL**
- **PHYSICAL DESIGN FLOW LIKE FLOOR PLANNING,PLACEMENT,CTS,ROUTING ETC**
- **STA TOPICS LIKE TIMING CHECKS,TIMING MODELS,TIMING PATHS,SETUP & HOLD TIME ETC**
- **HANDS ON EXPERIENCE ON LINUX/UNIX TOOLS**
- **DRC CHECKS,LVS CHECKS ANTENNA CHECKS, PARASITIC EXTRACTION ETC**

ANALOG DESIGN AND LAYOUT PROFILE

GOOD UNDERSTANDING ON :

- ANALOG DESIGN AND STA
- SCRIPTING LANGUAGES LIKE TCL , PERL
- IC FABRICATION STEPS
- RC CIRCUITS,VOLTAGE AND CURRENT REFERNCE CIRCUITS
- HANDS ON EXPERIENCE ON LINUX/UNIX TOOLS
- LAYOUT DESIGN AND PHYSICAL VERIFICATION TOOLS
- DRC CHECKS,LVS CHECKS ANTENNA CHECKS, PARASITIC EXTRACTION ETC

MEMORY DESIGN PROFILE

GOOD UNDERSTANDING ON :

- **ASIC DESIGN FLOW**
- **SCRIPTING LANGUAGES LIKE TCL , PERL**
- **CMOS VLSI DESIGN AND STA**
- **HANDS ON EXPERIENCE ON LINUX/UNIX TOOLS**
- **MEMORY BASICS**
- **SRAM , DRAM MEMORY READ/WRITE OPERATIONS AND FIFO DEPTH**

Study reference for Digital Design

- Book: Digital design by M.Morris mano
- Book: Digital design by John F. wakerly
- Link: https://nptel.ac.in/courses/106105185
- Link: https://nptel.ac.in/courses/117108040
- Link: https://nptel.ac.in/courses/117106086
- Link: https://onlinecourses.nptel.ac.in/noc20_ee05/preview
- Link: https://onlinecourses.nptel.ac.in/noc21_ee39/preview

Study reference for Digital IC Design

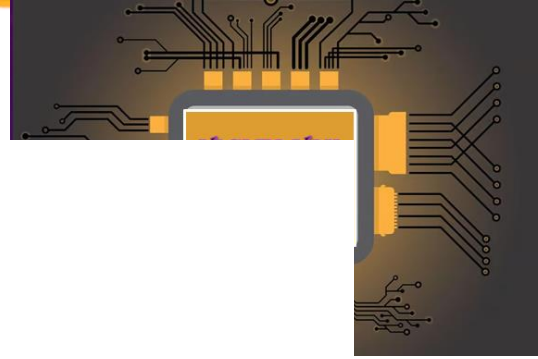
- Book: Digital Integrated Circuits 2nd Edition by Jan Rabaey
- Link: https://onlinecourses.nptel.ac.in/noc20_ee05/preview
- Link: https://nptel.ac.in/courses/108106158

Study reference for CMOS VLSI Design

- Book: CMOS VLSI Design by Neil H. E. Weste David Money Harris
- Book: CMOS digital integrated circuits analysis and design by s.m kang and y.leblebici
- Book: Low-Power VLSI Circuits and Systems by Ajit Pal
- Book: CMOS Analog Circuit Design 2nd Edition by Phillip E. Allen
- Book: Design of Analog CMOS Integrated Circuits by Behzad Razavi
- Link: https://nptel.ac.in/courses/108107129
- For CMOS fabrication: https://archive.nptel.ac.in/courses/117/106/117106093/

Study reference for Analog design

- Book: Design of Analog CMOS Integrated Circuits by Behzad Razavi
- Book: Analysis and Design of Analog Integrated Circuits by PAUL R. GRAY & MEYER.
- Book: Fundamentals of electric circuits by alexander sadiku
- Book: Microelectronic circuits by sedra and smith
- Link: https://www.youtube.com/playlist?list=PL6qRG5-NfbLvagdQOwShX9FMrzb5hSvrq
- Link:https://www.youtube.com/playlist?list=PL6qRG5-NfbLvCFCeCDwLWrloeOrQxP9ZE
- Link: https://www.youtube.com/playlist?list=PLm2lpl_krGU7w5rfCdD_tFd4ttUBAtRkG
- Link:https://www.youtube.com/playlist?list=PLO4mxQzfcml_56XSGcA8ULOv7qEtZd0Hy
- Link: https://nptel.ac.in/courses/117106108
- Link: https://nptel.ac.in/courses/108106084
- Link: https://nptel.ac.in/courses/117106030
- Link: https://archive.nptel.ac.in/courses/117/101/117101105/



Study reference for Verilog and System Verilog

- Book: Verilog HDL: A Guide to Digital Design and Synthesis by Samir Palnitkar
- Book : A Verilog HDL primer by J.Bhasker
- Book : System Verilog for verification by chris spear
- Book: Application-Specific Integrated Circuits by John Smith
- Book: System Verilog assertion handbook by Ajeetha Kumari, Ben Cohen, and Srinivasan Venkataramanan
- The UVM Primer: An Introduction to the Universal Verification Methodology by Ray Salemi
- System Verilog 3.1a Language Reference Manual from accellera
- System Verilog for design Book by Stuart Sutherland , Simon Davidmann and Peter Flake
- Universal Verification Methodology (UVM) 1.2 Class Reference from accellera
- Universal Verification Methodology (UVM) 1.2 User's Guide from accellera
- UVM cookbook from verification academy.
- Verilog Lecture Link: https://nptel.ac.in/courses/106105165
- Log In here to learn UVM: https://verificationacademy.com/
- Link: https://verificationguide.com/
- Link: https://www.youtube.com/playlist?list=PLBIILfL2t1Invzw7vF0arlvu36Wj4--D7
- Link: http://www.sunburst-design.com/papers/

Study reference for Design for Testability (DFT)

- Book: Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits by Michael Lee Bushnell and Vishwani Agrawal
- Book: VLSI TEST PRINCIPLES AND ARCHITECTURES DESIGN FOR TESTABILITY by Laung-Terng Wang, Cheng-Wen Wu ,Xiaoqing Wen
- Link: https://nptel.ac.in/courses/106103016
- Link: https://nptel.ac.in/courses/106103116
- Link: https://nptel.ac.in/courses/117106092
- Link: https://archive.nptel.ac.in/courses/117/105/117105137/
- Link: https://archive.nptel.ac.in/courses/117/103/117103125/
- Link for DFT (refer Lecture 47 to Lecture 56) https://archive.nptel.ac.in/courses/106/105/106105161/

Study reference for Physical Design (PD)/STA/Synthesis

- Book for STA: Static Timing Analysis for Nanometer Designs: A Practical Approach by Jayaram Bhasker and Rakesh Chadha
- Book: Advanced ASIC Chip Synthesis Using Synopsys Tools by Himanshu Bhatnagar
- Book: Constraining Designs for Synthesis and Timing Analysis: A Practical Guide to Synopsys Design by Sridhar Gangadharan & Sanjay Churiwala
- Book: Physical design essentials: an ASIC design implementation perspective by Khosrow Golshan
- Book: Algorithms for VLSI Physical Design Automation by Sherwani, N. A.
- Link: http://www.vlsi-expert.com/p/static-timing-analysis.html
- Link: https://archive.nptel.ac.in/courses/106/105/106105161/
- Link: https://www.udemy.com/course/vlsi-academy-sta-checks/
- Link: https://www.udemy.com/course/vlsi-academy-physical-design-flow/
- Link: https://www.youtube.com/c/Vlsi-expert/playlists
- Link: https://www.vlsisystemdesign.com/inception-content-vsd/

Study reference for TCL/Perl

- Book: Using Tcl With Synopsys Tools by Synopsys
- Book: Tcl and the Tk Toolkit Book by John Ousterhout and Ken Jones
- Book: Tcl/Tk in a Nutshell Book by Jeff Tranter and Paul Raines
- Link:https://www.youtube.com/playlist?list=PLtChGkQ0aIK-h8WHzPYHu9hwedupUM1Hm
- Link:https://archive.org/details/ebookpdfteachyourselfperlin21days/page/n513/mode/2up
- Link: https://archive.nptel.ac.in/courses/117/106/117106113/
- Link: https://www.perltutorial.org/
- Link: https://www.ee.columbia.edu/~shane/projects/sensornet/part1.pdf
- Link: https://www.tutorialspoint.com/tcl-tk/index.htm
- Link: https://www.tcl.tk/man/tcl8.5/tutorial/tcltutorial.html

THANK YOU