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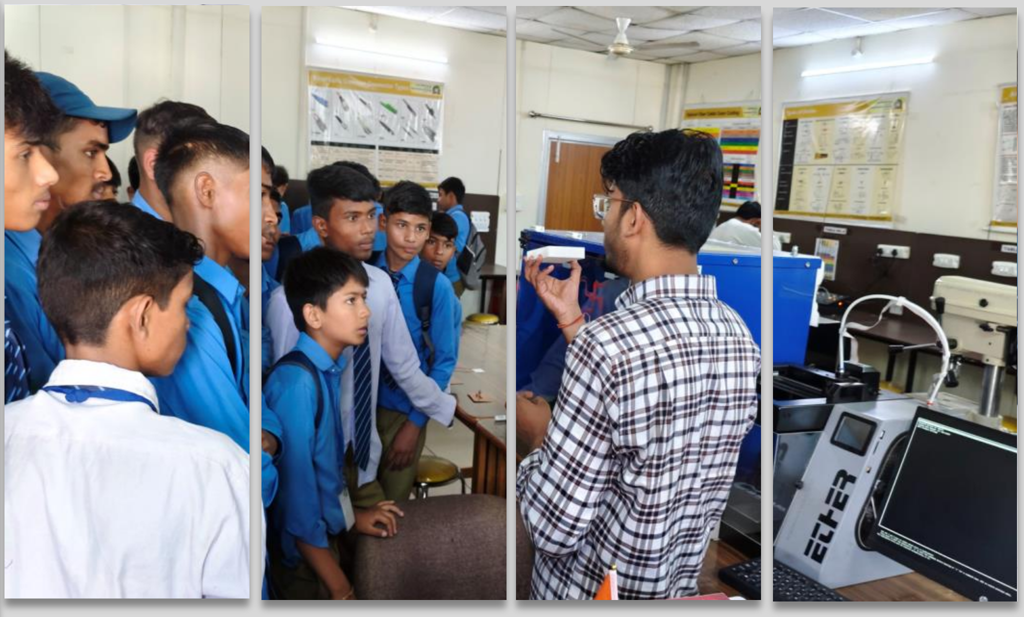

Curiosity was generated the picture says it all

Charcoal Pencil Art by Yashi Sharma (BT21ECE027)

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Skills required for the future VLSI Industry

The VLSI Industry continues to be a cornerstone of the Electronics and Semiconductor sectors, enabling advancements in computing, communications and consumer electronics. Below is an exploration of the current technology, future trends, and essential skills students need to excel in this dynamic field.

1. **Current technology in VLSI**
The VLSI industry is currently driven by cutting-edge technologies like FinFET and advanced process nodes, with 3nm and 5nm chips leading the charge in modern semiconductor fabrication. These nodes are critical for high performance computing, smartphones, and AI processors. Companies like TSMC, Intel and Samsung are pushing the envelope in manufacturing, leveraging Extreme Ultraviolet Lithography (EUV) for precision. Moreover, VLSI applications have extended to AI accelerators, GPUs and System on Chip (SoC) designs for IoT and automotive electronics, demonstrating the industry's versatility.

2. **Future Trends in VLSI**
The future of VLSI is promising, with a strong focus on:

Beyond Silicon Technologies: Research into materials like Graphene and Silicon Carbide for post Moore's Law scaling.

3D Integration and Chiplets: Techniques for stacking chips to improve performance and energy efficiency without relying solely on node shrinking.

Quantum Computing Integration: Innovations to accommodate qubits and quantum-classical hybrids.

AI and Machine Learning in Design: Automation of chip design using AI tools, enhancing design efficiency and reducing time-to-market.

Green Computing: Sustainable practices like energy-efficient designs and recycling of Silicon wafers.

3. **Skills students need for a VLSI career**
Breaking into the VLSI industry requires a mix of technical expertise, practical skills, and industry awareness. Key competencies include:

Technical Knowledge: Proficiency in digital design, analog design, semiconductor physics, and fabrication processes.

Tool Proficiency: Hands-on experience with Electronic Design Automation (EDA) tools like Cadence, Synopsys, and Mentor Graphics.

Programming Skills: Mastery of hardware description Languages (HDLs) such as VHDL and Verilog, and scripting languages like Python and TCL.

Analytical Thinking: Strong problem solving abilities to debug circuits and optimize designs.

Soft Skills: Communication, teamwork, and adaptability for collaborative, project driven environments. Internships, academic projects, and certifications in VLSI design are also vital for gaining a competitive edge.

In conclusion, the VLSI industry stands at the crossroads of innovation and practicality, offering immense opportunities for those equipped with the right skills and mindset. Students aspiring to enter this field should stay updated on technological trends, build hands-on experience, and foster a passion for continuous learning.

A Guide for Students Pursuing Analog IC design in power management ICs (PMICs)

Power Management Integrated Circuits are crucial components in modern electronics, responsible for efficiently managing power delivery, conversion, and regulation in devices ranging from smartphones to electric vehicles. Analog IC design for PMICs is a specialized field that offers exciting challenges and career opportunities. Below is an in-depth guide for students aspiring to enter this domain.

Why PMIC design is important?

The demand for energy efficient systems is driving innovation in PMICs. These ICs handle tasks such as voltage regulation, power conversion, battery charging, and system power distribution, ensuring devices operate efficiently and reliably. With the rise of portable electronics, renewable energy, and electric vehicles, PMICs are at the forefront of innovation in Analog IC design.

Key skills and Knowledge Areas for PMIC design

1. **Fundamentals of Power Electronics:**
   Study the principles of power conversion, including AC-DC, DC-DC (buck, boost, buck-boost converters), and DC-AC inverters. Understand concepts like efficiency, ripple, transient response, and thermal management.
2. **Control Systems Knowledge:**
   Learn feedback control theory, including PID controllers, compensation techniques, and stability analysis.
   Familiarize yourself with loop dynamics and frequency-domain analysis for stable power systems.

3. **Analog Circuit Design Expertise:**
   Master circuits like voltage regulators (linear and switching), current sources, charge pumps, and bandgap references. Understand design trade-offs between efficiency, size, and cost.

4. **Semiconductor device physics:**
   Explore the characteristics of MOSFETs, IGBTs, and diodes used in power applications. Learn how process technologies impact power IC performance.

5. **Power Layout Techniques:**
   Focus on layout considerations like minimizing parasitics, thermal dissipation, and electromagnetic interference (EMI).
6. **Battery Management Systems (BMS):**
   Study the principles of battery charging and discharging, cell balancing, and state-of-charge estimation.

Simulation Tools:
Gain proficiency with tools like LTspice, Cadence Virtuoso, and PLECS for circuit simulation and analysis. Use MATLAB/Simulink for modelling and system-level design.

7. **Standards and Regulations:**
Understand industry standards such as Energy Star, IEC62301, and UL certifications. Familiarize yourself with EMI/EMC compliance for PMICs.

Recommended pathways for students

1. **Academic Courses:**
Focus on power electronics, analog design, and energy systems during your undergraduate or graduate studies. Pursue electives or specialized courses in PMIC design if applicable.
2. **Hands-On Projects:**
Build and test basic DC-DC converters, linear regulators, or battery chargers. Use development kits like Texas Instruments or Analog Devices to experiment with PMICs.

3. **Internships and Research:**
Seek internships with semiconductor companies or research labs focusing on power management solutions.
4. **Specialized Certifications:**
Consider certifications or courses in power electronics and analog design from platforms like Coursera, edX, or professional organizations like IEEE.

Future Trends in PMIC design:

1. **High-efficiency solutions:**
Focus on improving conversion efficiency with GaN (Gallium Nitride) and SiC (Silicon Carbide) technologies for higher power density and lower losses.

2. **Low-Power Designs:**
The rise of IoT and wearable devices drives demand for ulta-low-power PMICs.

3. **Integration and Miniaturization:**
PMICs are increasingly integrated into SoCs to save space and reduce costs, especially in mobile and portable devices.
4. **Automotive and EV applications:**
Electric vehicles require robust PMICs for battery charging, energy harvesting, and motor control. PMICs for renewable energy sources, such as solar and piezoelectric systems, are gaining prominence

Resources for PMIC design

1. Books: "Power Electronics: A First Course" by Ned Mohan
"Switching Power Supply Design" by Abraham I. Pressman
"Fundamentals of Power Electronics" by Robert W. Erickson and Dragan Maksimovic

2. Online Resources:
Texas Instruments Power Management Tutorials

Analog Devices Power by Linear Design Resources.
Youtube channels like Power Electronics Tutorials and Keysight Engineering Education

3. **Conferences and Workshops:**
IEEE Applied Power Electronics Conference APEC)

International Symposium on Power Electronics and Applications (PEA)

Carrier Prospects in PMIC Design

PMIC design roles are abundant in semiconductor giants like Texas Instruments, Infineon, ON Semiconductor, and Analog Devices. Specialized roles include Power IC Designer, Systems Architect for PMICs, and Application Engineer for power systems. As devices become more energy efficient and compact, the expertise of PMIC designers will remain in high demand. By acquiring a strong foundation in power electronics, analog design, and control systems, students can position themselves for a successful carrier in this dynamic and impactful field.

Placements

Mayank Agarwal, 2021-25 Batch student of Electronics Engineering Department has been selected for Internship at SAMSUNG. The following were the rounds for selection:

Coding Round:
1) DFS (Depth-First Search) – from Data Structures and Algorithms
2) Dynamic Programming – from Algorithm Design and Optimization

Technical Interview:
1) Project – Full Stack Development Skills
2) Operating Systems – Process management, memory and synchronization
3) Object Oriented Programming (OOP) – Concepts like inheritance and polymorphism

HR Round:
1) Introduction
2) Strengths and Weaknesses
3) Puzzles

Preeti Tomar, 2019-23 Batch student has been selected as Engineering Executive Trainee (EET) at the National Thermal Power Corporation (NTPC) through GATE 2024.

Conference Papers Presented

Kuldip Kumar presented a paper titled "Stability criteria for an uncertain delayed neural network" at 3rd International Conference on Advances in Computing Communication and Materials (ICACCM2024) organized Tula's Institute Dehradun co-authored by Kuldip Kumar and S. K. Tadepalli during 22-23 November, 2024 at Dehradun, India.

Rahul Prakash presented a paper titled "Revisiting Algorithm Based Approach for Determining System Stability of Delayed Systems" at 3rd International Conference on Advances in Computing Communication and Materials (ICACCM2024) organized Tula's Institute Dehradun co-authored by Rahul Prakash and S. K. Tadepalli during 22-23 November, 2024 at Dehradun, India.

Book Chapter

Ritu Tanwar, Ghanapriya Singh, and Pankaj K. Pal. "Non-invasive Stress Recognition Framework Using Consumer Internet of Things in Smart Healthcare Applications." In Pradhan B., Mukhopadhyay, S. IoT Sensors, ML, AI and XAI: Empowering A Smarter World. Smart Sensors, Measurement and Instrumentation Vol. 50 Springer Cham. (2024): 259-277.

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Faculty and students are requested to submit articles both Engineering and General Articles. If any achievement has been missed in this Newsletter you can email to eceoffice@nituk.ac.in or sktadepalli@nituk.ac.in