CHIP DESIGN TECHNICIAN

KNOWLEGE & SKILLS

By Micro Nano Technology Education Center in partnership with Siemens and Innovate In America

MNT-EC CHIP DESIGN TECHNICIAN KNOWLEDGE

KNOWLEDGE IS A BODY OF INFORMATION APPLIED DIRECTLY TO THE PERFORMANCE OF A FUNCTION.

K-1 Explain how a semiconductor transistor works, the basic physics and device applications.

K-2 Describe the chip creation processes including wafer preparation, etching, deposition, lithography, and diffusion.

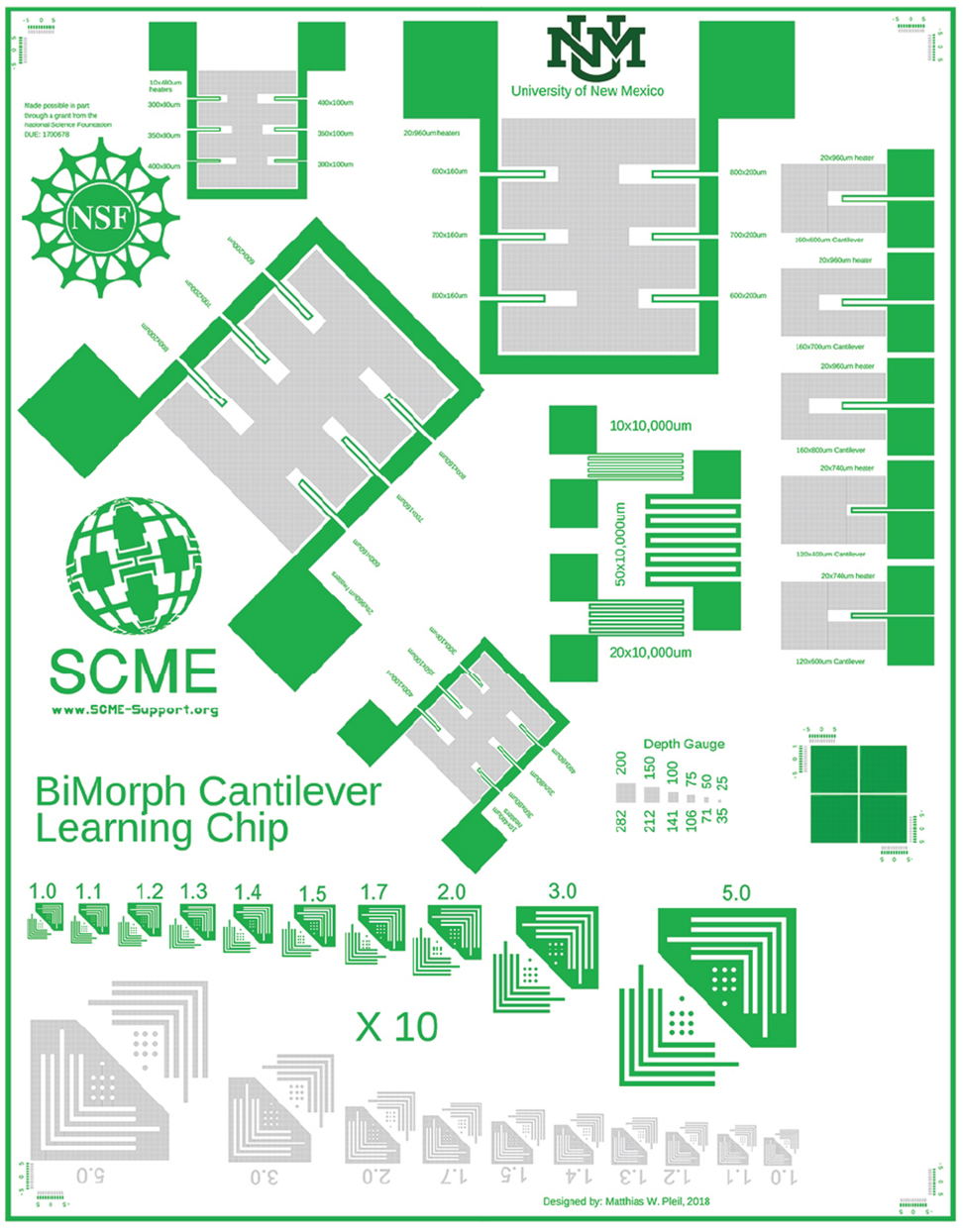
K-3 Identify major semiconductor device types (e.g., MOSFETs, Bipolar Junctions) and their operational principles.

K-4 Describe materials used in chip design, properties, and device packaging impact on performance.

K-5 Explain electrical principles like current, voltage, resistance, and circuit analysis (AC/DC, digital, RF).

K-6 Discuss design principles for digital and analog circuits.

K-7 Describe computer system organization, component interaction, memory hierarchy, parallel programming, and performance enhancements.



Multilayer bimorph cantilever mask field design.

K-8 Discuss chip functionality within larger systems and design requirements to meet specific functions.

K-9 Describe System-on-Chip (SoC) architecture, processor integration, signal integrity, and tape-out process.

K-10 Discuss the Principles of design verification, including Universal Verification methodology and application to System on Chip design.

K-11 Explain System-on-Chip failure modes, industry standards, test methods for compliance, and Automated Test Equipment usage.

K-12 Identify the potential causes of IC failures at the material, device, or circuit level.

K-13 Knowledge in soldering, Electrostatic Discharge awareness, safety procedures, Electromagnetic interference, and Electrical safety procedures.

TECHNICIAN SKILLS

SKILLS ARE OBSERVABLE COMPETENCIES USED TO PERFORM A LEARNED PSYCHOMOTOR ACT: HOW WELL CAN A STUDENT EXECUTE A SPECIFIC ACTIVITY?

ST-1 Skill in designing and conducting experiments, collecting data, and analyzing results using statistical process control (SPC).

ST-2 Proficiency in using SPICE, TCAD, and other design and simulation tools for circuit analysis.

ST-3 Skills in managing complex VLSI designs using top-down design principles.

ST-4 Skill in using Electronic Design Automation tools to verify IC design for manufacturability and functionality.

ST-5 Skill in performing, placing and routing, managing power distribution, and conducting clock tree synthesis in SoC design.

ST-6 Skill in creating and modifying layout synthesis scripts for SoC designs.

ST-7 Skill in implementing Design for Testability techniques including fault modeling, scanning chain insertion, and automated test pattern generation.

ST-8 Skill in building and testing SoC prototypes in the intended system environment.

ST-9 Skill in using tools and techniques to identify and mitigate potential SoC design failures.

ST-10 Proficiency in C++, Python, and LabVIEW for data processing and analysis.

ST-11 Skill in using a variety of test instrumentation relevant to chip design and testing.

ST-12 Skill at determining the speed at which signals are propagated to ensure proper functioning

ST-13 Skill at using specifications to drive specific choices in IC architecture

ST-14 Skill at properly using industry-standard EDA tools throughout the design process

ST-15 Skill in using industry-relevant process design kits and design rule checkers, to follow design rules and implement manufacturable layouts.

ST-16 Skill in applying physics-based modeling tools like Sentaurus or COMSOL for chip simulation and analysis.

ST-17 Skill in applying statistical analysis, error propagation, and quantitative reasoning in circuit design and validation.

Students examining a microfabricated pattern based on the mask design in UNM's MTTC cleanroom.

MNT-EC

Micro Nano Technology
Education Center

MNT-EC Welcomes Involvement of Employers & Educators

The Micro Nano Technology Education Center (MNT-EC) was founded on the idea that working together with employers and educators will enhance the quality of education for students who then become higher quality technicians for the micro and nano technology industry.

Email info@micronanoeducation.org to join the initiative or ask questions.

Pasadena City College

NSF