DIGITAL VLSI

ELECTRICAL & COMPUTER ENGINEERING
UNIVERSITY of WASHINGTON

OVERVIEW

How is computation physically performed? How do software applications actually get implemented in hardware? How do you build processors for the next generation of machine learning applications, data-centers, 5G communication systems, and implantable computing? The focus of the VLSI concentration at its foundation is to understand computing hardware and leverage the power of modern silicon to build systems. Indeed, at a basic level, the VLSI concentration focuses on teaching students to learn how to build at scale, exploiting advances in silicon fabrication to craft systems that are tailored to a range of desired applications.

AREAS OF IMPACT

- Air & Space
- Computing Data and Digital Technologies
- Environment Sustainability and Energy
- Health and Medicine
- Robotics and Manufacturing

STUDENTS MIGHT BE INTERESTED IN THIS CONCENTRATION IF THEY ENJOY:

Creative problem solving, applying theory (whether it be math, physics, computer science, signal processing, control theory and cryptography, to name a few) for building next-generation computing systems. A basic grounding in math and physics is expected to build an understanding in this area. Programming is frequently used to automate various aspects of design building.

WHAT KINDS OF JOBS DO STUDENTS GET AFTER GRADUATING?

Design, Validation and Test engineering at a number of companies, including:

- Intel
- Micron
- Apple
- AMD
- Qualcomm
- Infineon

WHAT KIND OF INTERNSHIPS DO STUDENTS PURSUE?

Students from the VLSI concentration typically pursue internships in companies such as Intel, Apple, Micron, AMD and Qualcomm. They span a variety of roles including describing processor architecture, verifying their operation using a mix of hardware and software knowledge, designing circuits for chips, and testing and validating them. Undergraduates, however, typically are not offered the opportunities to describe computing architecture or build custom circuits – those roles are typically reserved for MS/PhD students.

WHAT RESEARCH OPPORTUNITIES ARE AVAILABLE TO UNDERGRADUATES IN THIS CONCENTRATION?

Numerous research opportunities exist, from working on neural interfaces to cryptographic chips, multi-processor designs, communications chips and machine learning accelerators.

WHAT KIND OF PROJECTS DO STUDENTS COMPLETE IN THEIR CAPSTONE?

All students team up to build their own RISC microprocessor design, doing everything from targeting an application, defining key, creative architectural features and circuits based on those applications, describing them in software, building processor circuits and demonstrating their proper operation.

DO STUDENTS NEED A GRADUATE DEGREE SPECIALIZING IN THIS AREA TO BE MARKETABLE IN INDUSTRY?

No, and yes. There is currently a huge growth in demand for VLSI concentration-related jobs, especially for students from UW. Apple, Micron, Intel and, as of this year, AMD are actively seeking students from these concentrations. Micron and Intel in particular sponsor the senior undergraduate VLSI class and the capstone classes respectively. However, the nature of these well-paying jobs mirrors that of undergraduate internship opportunities. MS and PhD students, or BS students with 3-4 years of experience, typically get opportunities to work in the areas of architecture and circuit design and methodology.

WHAT CLASSES OUTSIDE OF ECE WILL HELP STUDENTS LEARN RELATED AND USEFUL SKILLS?

VLSI touches on a lot of areas within ECE, but typically not too far beyond basic courses in computer science. An understanding of linear algebra is always great (though that's likely true for most disciplines you encounter).

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QUESTIONS? Contact us at: undergrad@ece.uw.edu or attend a prospective drop in session: *bit.ly/eceadvising*