INTEGRATED SYSTEMS

ELECTRICAL & COMPUTER ENGINEERING UNIVERSITY of WASHINGTON

OVERVIEW

The application space for integrated systems is virtually unlimited. Circuits and sensors that are integrated on a single chip benefit from orders-of-magnitude reduction in cost, size and power as compared to discrete, boardlevel solutions of electronic systems. Example applications include single-chip radios found in your cellphone and laptop, all sensor interfaces including biosensors (neural interfaces, devices for spectroscopy, blood analysis, etc.), and virtually all microelectronic devices implanted in the body. In addition, design of integrated circuits and systems is becoming an essential skill for developing a variety of emerging hardware platforms such as electro-optical radars for autonomous vehicles and analog neural networks. Those who have skills in designing these devices are typically in very high demand, both within industry and academia (faculty in the VLSI group are always on the lookout for grad students with good IC design skills).

STUDENTS MIGHT BE INTERESTED IN THIS CONCENTRATION IF THEY ENJOY:

Integrated circuit and system design requires a very broad set of STEM skills. Students who succeed in this area enjoy math, physics (particularly electrostatics and dynamics), and programming to accelerate design using industry accepted tools such as Cadence and Spice. Future integrated circuit and system designers should have a strong attachment to emerging applications for microelectronics such as biomedical systems, communication platforms, sensor applications, power electronics and technologies for computation.



AREAS OF IMPACT

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

WHAT KIND OF INTERNSHIPS DO STUDENTS PURSUE?

Students in the IS concentration regularly get internships at Apple, Texas Instruments, Qualcomm, Intel Corp, AMD, Marvel LtD, Boeing, Google, Microsoft and Facebook, to name a few. Any company or research lab that implements high-performance, low power electronic systems is a natural fit for the IS concentration.

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

Students in IS can benefit from a diverse set of courses offered outside of ECE, depending on their interests. For instance, if they are interested in wireless circuits, they can take courses on electromagnetics from the physics department, or a student may be interested in chips for neural interfaces and would benefit from taking neural engineering classes in both ECE and BioE.

WHAT KIND OF PROJECTS DO STUDENTS COMPLETE IN THEIR CAPSTONE?

Typically, students design an electronic system or sub-system that could be included in a single-silicon chip. Often, students optimize their design for minimal power, the highest speed, or minimal cost, as these reflect common goals found throughout industry, whether for IC or board design.

WHAT KINDS OF JOBS DO STUDENTS GET AFTER GRADUATING?

Typical jobs include system and circuit design for biomedical, communication and sensor interface systems in companies such as Apple, Intel, Google, Facebook, Qualcomm, Intel, AMD, Marvel, Broadcom, Analog Device Inc, Tesla, SpaceX, Boeing and Microsoft, to name a few.

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

No, there are plenty of jobs in the semiconductor and broader industry that require skills from the IS concentration. In fact, the skills learned through IS are likely some of the broadest found in the entire **Department of Electrical & Computer** Engineering. Students can virtually work at any company that develops/designs electronic systems, whether on a chip or realized on a printed circuit board. To realize an electronic hardware system requires programming skills for CAD, and circuit and system design skills. While there are an abundance of jobs after completing an undergraduate degree with a concentration in IS, students will benefit enormously if they continue on to obtain a graduate degree in electrical and computer engineering. The majority of top graduate engineering schools have indeed been expanding in the area of IS recently.

WHAT RESEARCH OPPORTUNITIES ARE AVAILABLE TO UNDERGRADUATES IN THIS CONCENTRATION?

Virtually any lab that builds hardware for an end application will benefit from students who have skills from the Integrated Systems (IS) concentration. Specifically, students in IS learn the fundamentals of device physics and circuit design, which are "bricks and mortar" skills of all hardware design in electrical engineering. End applications that could be built with skills from IS include implantable biomedical systems, high-frequency chips for mm-Wave and Radio Frequency communication, and interfaces to sensor systems.



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