

New Master's Specialization in Quantum Computing & Information

Creating a diverse taskforce with quantum computing know-how

By Hiu Yung Wong, assistant professor, Electrical Engineering

FOR DECADES, NON-PHD MINORITY SERVING

Institutes (MSIs) have been steadily providing a diverse workforce to the semiconductor industry, which sustains the United States semiconductor industry's ecosystem and its competitiveness. For example, Silicon Valley companies such as Apple and Cisco hire the largest number of alumni from San José State as test engineers, circuit and layout designers, device engineers, programmers, marketing and program managers, business analysts and lawyers.

This hiring is also a result of the close collaboration between San José State and industry around internship and certificate programs. Our college is convinced that for the American quantum computing and information industry and ecosystem to be successful and competitive, a diverse taskforce with quantum computing know-how from MSIs is not just crucial but essential.

The Electrical Engineering (EE) department recently created a specialization in Quantum Computing and Information for its Master's degree program. As initially planned, this specialization comprises three classes:

1. Introduction of Quantum Computing (EE225), first offered in spring 2020 by leveraging the Quantum Classroom, a collaboration between San José State and IBM. Students learn quantum computing algorithms and verify them by running on IBM quantum computers. This class will be offered again in fall 2021.
2. Cryogenic Nanoelectronics (EE226). To be offered in spring 2022. Students will learn the physics and design of transistors and

integrated circuits that are used to manipulate and control quantum computers at cryogenic temperature (4.2K). Through recently awarded NSF funding, students will also gain hands-on experience in cryogenic electrical measurements.

3. Quantum Physical Qubit Architectures. Starting in fall 2022, students will learn various physical implementations of qubits that are used in quantum computers.

According to plans within the EE department, the specialization will be improved with feedback from the industry. Since microwave engineering, signal processing, control theory, et al. are critical to the success of large-scale quantum computers, quantum computer-related teaching materials will be added gradually to the respective traditional EE classes.

Read more about the Quantum Classroom at www.sjsu.edu/it/ibm-collaboration/quantum-classrooms.php. Questions? Write to Professor Wong at hiuyung.wong@sjsu.edu. ☺

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Agile Programs for Silicon Valley Professionals

How Engineering Extended Studies works

By Rebecca Lee

SAN JOSÉ STATE HAS HAD A long-time collaboration with Silicon Valley because of our location and presence. Over a decade ago, the College of Engineering recognized the need for agile Master's programs for professionals. We collaborated with corporate partners to share the academic expertise of San José State's engineering faculty and customize programs to their specific needs. The College of Engineering has offered corporate programs to eight companies over the past ten years, some of which were offered through multiple programs and cohorts.

The corporate Master's programs have many positive collaboration outcomes for the university,

corporate partners, and the students. Engineering employees gain skills relevant to their fields and apply learning to their work in real time. The classes are taught by faculty and industry subject matter experts using instructional design tools for remote work. They are cohort-based and they meet working students' needs, such as meeting one evening per week at the company's facilities.

San José State builds stronger connections with industry partners and a core alumni base at companies, and this leads to more research collaborations and more student internship opportunities. Industry experts share their knowledge in cutting-edge fields as part of the curriculum, and sometimes the special topics courses that were developed may

be permanently adopted into university curriculum.

Corporate partners benefit as well, with employees earning Master's degrees by learning skills and concepts that are both tailored to advance company goals and applicable to their daily work. Employees can also take individual courses relevant to their work as non-degree seeking students. Flexible schedules and convenient class times and locations aid hybrid delivery, a boon for employees with families. Students receive dedicated staff support for navigating the university's processes and requirements, and tuition reimbursement from employers. Most important, their learning is relevant to their job and valued by their employer. ☺