Matthew Swabey

Director

Purdue University

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10:00 AM • MSEE 180

11:15 AM • MSEE 180

The multidisciplinary challenge to leverage SDRAM - a SoC designer's perspective

Abstract: Synchronous Dynamic Random Access Memory (SDRAM) is the industry standard low-cost, high capacity, semiconductor random access memory technology. However, the advantages of SDRAM come with a considerable cost: complexity. This seminar will introduce the history and structure of SDRAM, before presenting and analyzing the design & verification challenges, from system level optimization, through digital design considerations, mixed signal design considerations, and finally looking at packaging (inc. SIP/HBM), ESD, and PCB design considerations.

Community supported End-to-End Semiconductor Design-Build-Test for Education and Research at Scale

Abstract: As a candidate for Professor of Practice for Microelectronics at Purdue, I will present my vision of enabling faculty, graduates and undergraduates to use microelectronics as a tool to solve real-world problems. I will discuss existing challenges to multi-disciplinary hands-on microelectronics education and research through my experiences at Southampton (UK) as MSc Microelectronics Systems Design Program Leader, and at Purdue as both Deputy Director of Undergraduate Labs, ECE, & Director of the Bechtel Innovation Design Center. I will then propose how Purdue can efficiently engage and support faculty, students and researchers at scale through the creation of a central, welcoming and diverse community for microelectronic learners and researchers. Strategies to ensure the community provides a student-centered, autonomy-supportive, learning environment, and how to leverage it for outreach will be discussed. Likely community solutions to microelectronic challenges will be discussed using examples drawn from my existing 4500 strong community at the Bechtel Center. Finally, I will discuss metrics, and success criteria for such an activity.

Bio: Dr. Swabey became the inaugural Director of the Bechtel Innovation Design Center, the multi-disciplinary makerspace at Purdue, in 2017. Through building a large online community, developing streamlined workflows, and leveraging automation through cloud CAD/CAM the Center helps Purdue students realize their projects at scale. So far in 2023 the online community has grown to more than 4500, and the Center has supported more than 1600 new students + 600 returning students manufacture their projects. Dr. Swabey received his Ph.D. degree in electronic engineering from the University of Southampton, U.K., in 2006. He has held multiple research positions before being appointed Teaching Fellow in 2007 at the University of Southampton, U.K. As teaching fellow he joined the ARM-ECS Research Center, designing and supporting the design of 10+ educational and research ASICs/SoCs. He was appointed MSc Microelectronics Systems Design Program Leader, the fastest growing MSc program at Southampton, while working on research and educational SoCs.

In 2011 he emigrated to the USA to become Deputy Director of Laboratories in Electronics and Computer Engineering at Purdue. Dr. Swabey managed the curriculum and delivery of a portfolio of mixed signal laboratory courses at scale, including the two largest laboratory classes and Senior Design. Over five years ~6,500 students took labs, multiple classes were overhauled and replaced, and technologies updated. He co-founded the SoCET team with Dr. Mark Johnson, enabling undergraduate students to design and tape out system-on-chips. The SoCET team is on its seventh generation educational SoC based on a student developed RISC-V core.

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