# Striking a Balance Between Low-Level Theory, High-Level System Design, and Typical Industry Challenges

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## Abstract

Engineering classes at the junior and senior level must often strike a balance between covering the theory of low-level components and integrating knowledge at a high or system level. At the same time, the classes must also expose students to challenges they would typically encounter in industry.

This presentation describes meeting these three competing objectives in a VLSI (Very Large Scale Integration) class offered in the Electrical and Computer Engineering Department at Ohio Northern University.

In this class, the low-level theory objective is met through lecture topics such as MOS transistor theory, gate delay and power consumption. The high-level system design objective is met in the lab by modelling a complete microprocessor constructed from diverse functional sub-units. To meet the industry experience objective, the students are challenged to test and debug their own designs and resolve simulation issues with different design and testing tools.

This three-objective approach has been implemented for two years, and the presentation discusses how management of student expectations was revised to improve student experience. The presentation also discusses benefits to students in terms of project-based learning and team building. Finally, the presentation describes the trade-offs of using Electric as an open source CAD tool for the project and the experience students gain from using SystemVerilog as a hardware description language to verify their designs.

*Biographical Information*
**Ziad Youssfi,** z-youssfi@onu.edu Assistant Professor of Electrical and Computer Engineering at ONU. Dr. Youssfi's current research focuses on dynamically quantifying program parallelism to guide policies that reduce processor energy and optimize performance on heterogeneous systems. His research interests also include embedded systems development such as wearable technology. He earned his PhD, MS, and BS in Electrical & Computer Engineering from Michigan State University in East Lansing. He worked with Intel Corporation on the P6 line of processors and chipsets. During his PhD, he developed a financial web application that helped colleges at Michigan State University to streamline their finances.