

Course Name : CMOS Digital Integrated Circuits **Instructor Name** : Syed Arsalan Jawed, PhD

Semester : Fall 2015

Credits : 3+0

About the Course

This course focuses on digital integrated circuits design based on CMOS devices at the custom-design abstraction level. Advanced CAD tools have highly automated the digital design flow and have brought designers to higher abstraction levels where they only need to think behaviorally about the system without bothering about the actual implementation at the circuit level. However, to achieve fully-optimized application-specific digital circuits, which address area, power and performance paradigms together, it is imperative to go lower in abstraction and make circuits by connecting individual MOSFET devices by the designer himself. This course reviews the necessary MOSFET device physics at the start and also touches the dynamic large-signal aspects of the device. It then delves in to the details of one of the most basic digital cells, the inverter, and goes through its static, dynamic behaviors with its energy-delay optimization. It then deals with the design of static combinational logic cells using complementary CMOS and pass-gate logic followed by the design of static and dynamic sequential components. This course then diverts its focus towards electrical interconnects that have recently received immense attention due to the requirement of increases data-rates/interconnect while highlighting the fact that designing high-performance digital circuits without considering the performance of under-consideration interconnect is not feasible anymore. This course concludes by looking into the details of the most critical timing issues found in digital circuits again from a design perspective.

Text Book

Digital Integrated Circuits

Jan M. Rabaey

Second Edition, 2003.

About the Instructor

Dr. Syed Arsalan Jawed received his PhD in 2009 jointly from University of Trento and Fondazione Bruno Kessler, Italy. He has worked with renowned organizations such as ST Microelectronics, Analog Devices, NESCOM and KACST. He has been mainly focused on analog and mixed-signal integrated circuits design for sensor readouts, high-speed signaling over electrical interconnects, data-converters. He has been the author/co-author of several journal and conference publications along with a few international patents in the same field.