THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

Tawfiq Musah

Assistant Professor, The Ohio State University

Director

Mixed-Signal Integrated Circuits and Systems Lab

Bio and Contact Information

Tawfiq Musah, Assistant Professor
Electrical and Computer Engineering
316 Dreese Labs | 2015 Neil Avenue Columbus, OH 43210
Office: 614-292-0391 | Email: musah.3@osu.edu
Web: http://mics.engineering.osu.edu

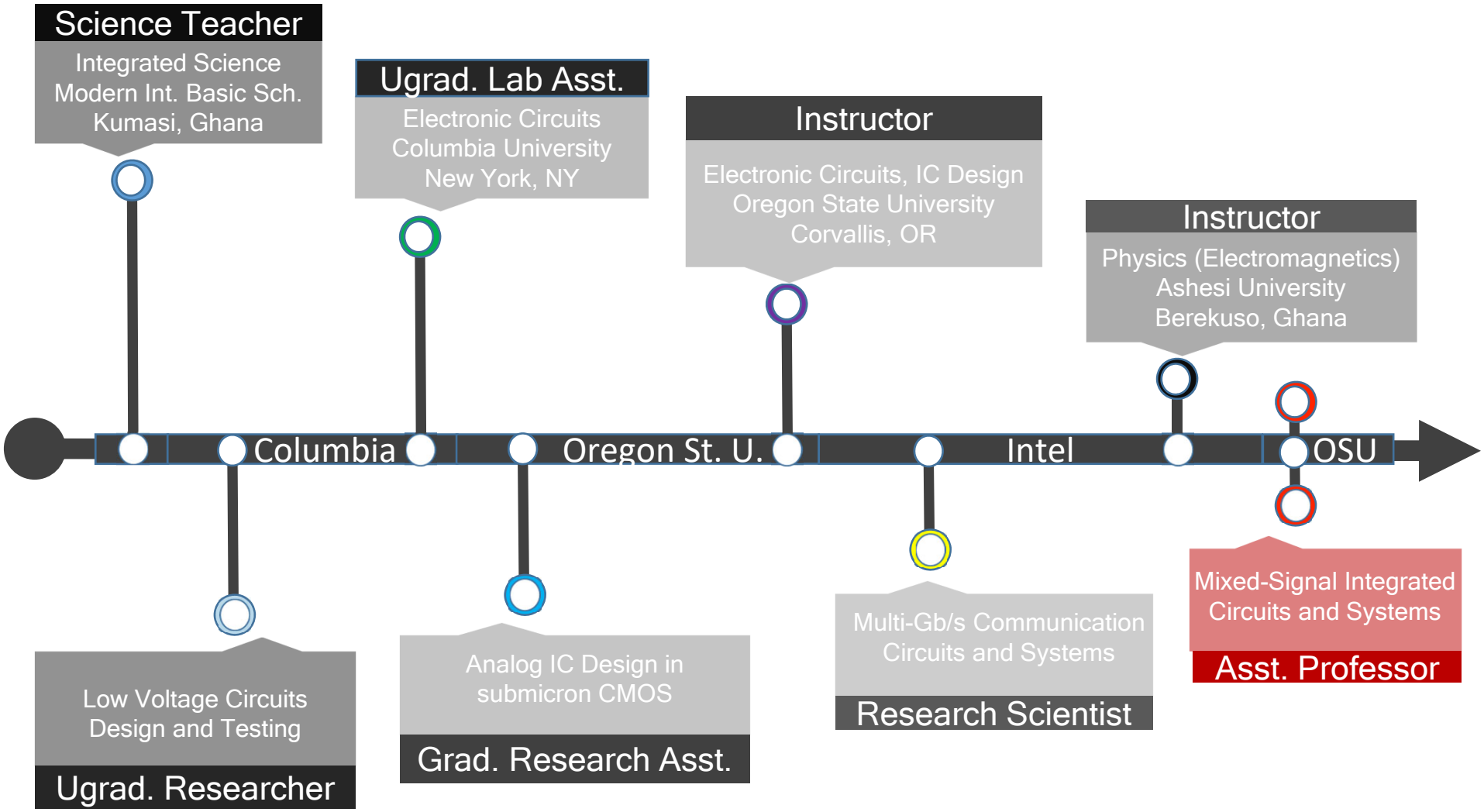
Contact for advice on course, research and career questions. And oh, I love to play and argue about soccer!

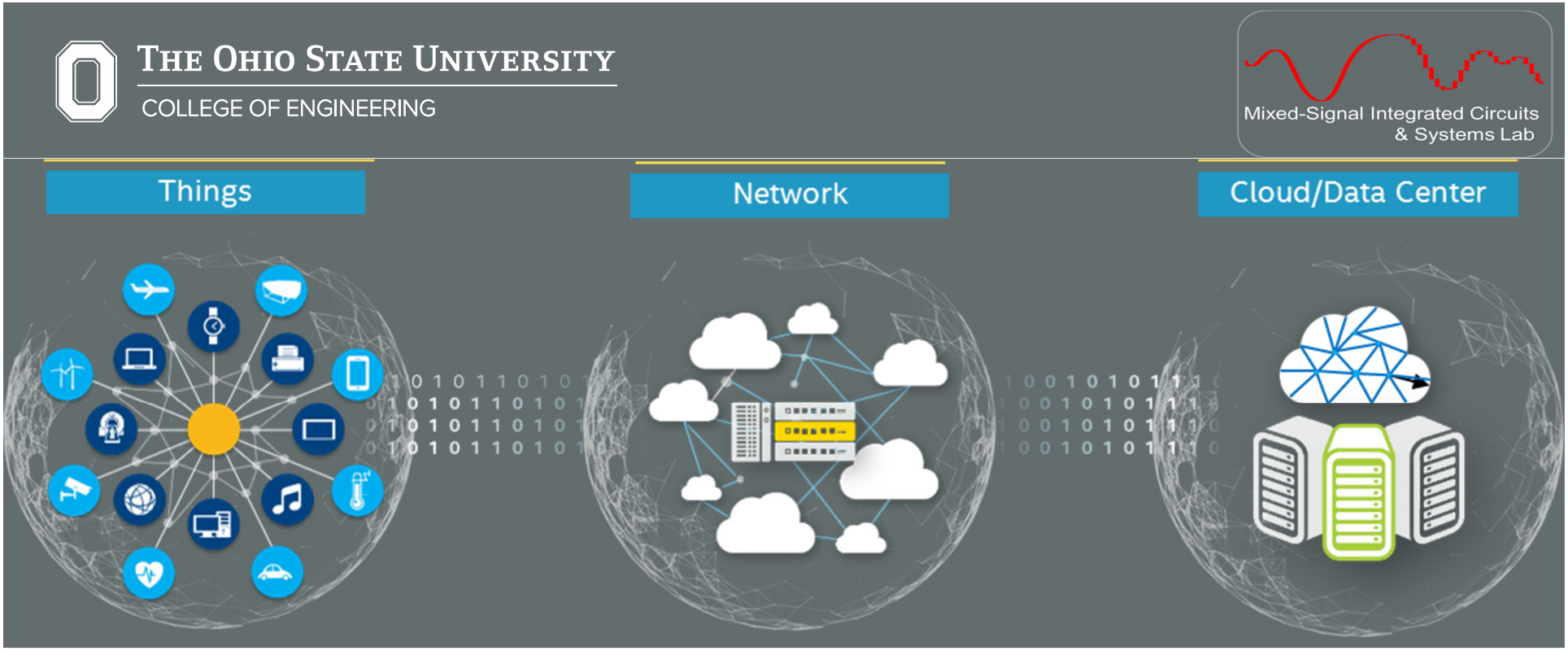
Tawfiq Musah received the B.S. degree in electrical engineering from Columbia University, New York, NY, USA, in 2005 and the Ph.D. degree in electrical and computer engineering from Oregon State University, Corvallis, OR, USA, in 2010.
From 2010 to 2018, he worked at the Signaling Research Lab at Intel Corporation, Hillsboro, OR, USA, on circuits and systems to enable Intel's next generation chip-to-chip electrical and optical links. Before joining Intel in 2010, he interned at Texas Instruments (TI) designing a hardware sensor in 2010 and Intel Labs working on micro-power ADC in 2006 and 2007.

He is currently an Assistant Professor in the Department of Electrical and Computer Engineering at The Ohio State University, Columbus, OH. His research interests include low-power equalization techniques for next-generation electrical and optical I/O links, multi-GS/s ADCs and high-level circuit modeling and verification.

Academic Geography

Timeline: Teaching & Research





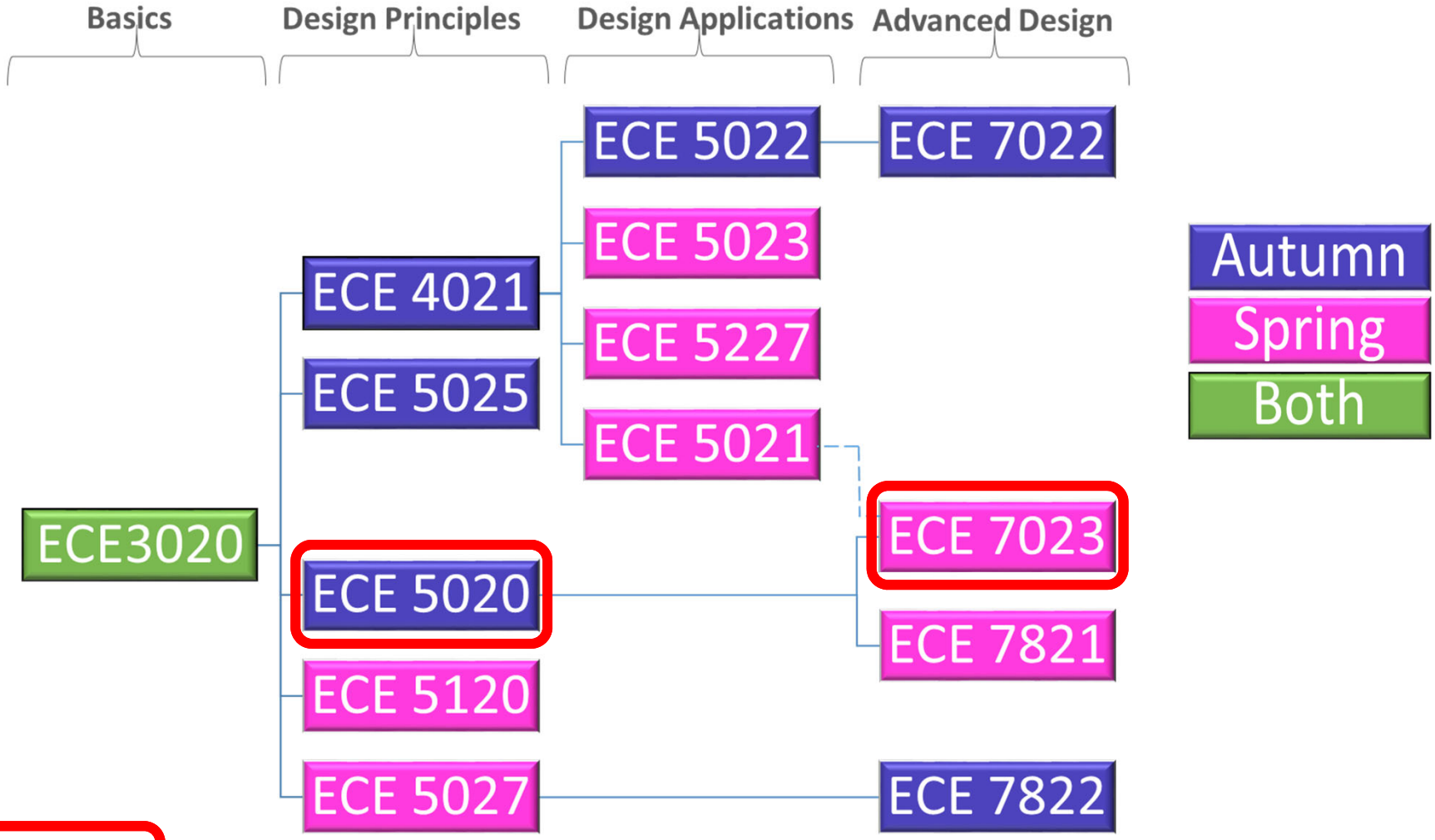
- Smart and connected devices have led to an explosion of data
- The ICs powering these devices have to be fast, compact and low power
- Emerging applications also call for end-to-end data security

My research focuses on hardware innovations that enable the processing and high speed transport of data in a secure and high fidelity manner.

Impact Areas of Circuit Design

- Computing & Robotics
- Autonomous Vehicles
- Data Center / Storage
- Medicine & Genomics
- Consumer Electronics
- Virtual/Mixed Reality

Circuit Courses



My courses, I teach 3020 in Spring

Undergraduate Elective Descriptions

- **ECE 4021 Analog Integrated Circuits I:** *3 credits, prerequisite: 3020, Offered: Fall*. Fundamentals of analog integrated circuits. CMOS transistors and diodes large-signal and small-signal operation and modeling. On-chip passive components operation and modeling. Simple and advanced current mirrors, single-ended and differential CMOS amplifiers, CMOS OTAs and Op-Amps. Integrated Circuits Fabrication, Packaging, and Testing.
- **ECE 5020 Mixed signals:** *3 credits, prerequisite: 3020, Offered: Fall*. Design and circuit analysis of basic VLSI structures such as adders and registers; custom macro-cell, bit slice, and re-use design concepts; physical layout design, layout parasitics extraction, logical effort, use of VLSI design tools. SRAM & sense amplifiers, Digital and Analog I/O, clocking PLLs.
- **ECE 5021 Analog Signals II:** *3 credits, prerequisite: 4021, Offered: Spring*. Advanced analog integrated circuits. Linear feedback networks design and stability analysis, multi-stage CMOS op-amp design and compensation, fully-differential op-amps and common-mode feedback networks, comparators, transconductors, bandgaps, sample and hold circuits, switched-capacitor circuits, noise analysis of CMOS circuits.
- **ECE 5022 Radio frequency integrated circuits (RFIC):** *3 credits, prerequisite: 4021 OR 5021, Offered: Fall*. Modulation, wireless standards, transceiver architecture, transistor models, passive component models, MOS and bipolar LNA, VCO, Mixers, integrated PA, PLL, prescalers, RFIC layout.
- **ECE 5023 – Introduction to Data Converters and Phase-Locked Loops –** *3 credits, prerequisite: 4021, Offered: Spring, Even years.* This course focuses on fundamentals of data converters and timing circuits, including discrete-time analog/mixed signal analysis and signal conditioning for asynchronous and synchronous computing. The topics include analog switches, sampling circuits, switched-capacitor amplifiers and filters, Flash ADCs, SAR ADCs, DACs, PLLs, DLLs and discrete-time neural networks
- **ECE 5025 Power Electronics: Devices, Circuits and Applications:** *3 credits, prequisite: 3020, Offered: Fall*. Provides an introduction to power electronic conversion principles. Analytical techniques will be developed through the study of widely used converter circuits.
- **ECE 5027 Active Microwave Circuits:** *3 course + 1 lab credits*, prerequisite*: 3020, Offered: Spring*. Design principles of microwave transistor amplifiers, oscillators and mixers including low-noise, power, and broadband design; nonlinear RF behavioral modeling, harmonic balance simulations, additive phase noise in oscillator and PA, high efficiency PA and linearization; microstrip realizations, linear and nonlinear measurements in the laboratory; design project.
- **ECE 5120 Introduction to Integrated Circuits Test and Measurements:** *3 credits, prerequisite: 3020, Offered: Spring, Odd years*. Parametric testing for analog, sampled-data/mixed signal, RF digital channels, DSP-based testing, noise behavior, testability, Design-for-Test and Built-in-Self-Test.
- **ECE 5227 Fundamentals of Power Management Integrated Circuits for VLSI Systems:** *4 credits, prerequisite: 4021, Offered: Spring, Odd years*. Theory, design and applications of integrated power management integrated circuits in VLSI systems. This includes: system and circuit architectures, performance metrics, practical implementations, design considerations in VLSI systems in advanced CMOS processes, and design techniques for integrated power regulators and battery chargers. Background in basic analog design is strongly recommended.