

2-Day Short-Course on Selected Topics in Mixed-Signal IC Design

By David A. Johns

Date: 24th & 25th June 2019

Venue: University of Limerick

OpAmp Stability and Optimization

1x1.5 hours

This talk will discuss stability as it relates to small and larger circuits. Topics include loop-gain/poles relationship, return-ratio, blackman-impedance, pole-splitting, dealing with positive zero, and nested-miller compensation.

Low-Power OpAmp Design and Biasing (Part I & II)

2x1.5 hours

This talk will discuss opamp design with an emphasis on low power, biasing approaches and transistor sizing. Topics include weak/strong-inversion biasing, design choice of $V_{eff}/W/L$, constant-current/PTAT/constant- G_m biasing, Rapid multistage analysis, two-stage opamps, telescopic opamps, folded-cascode opamp, differential opamps and common-mode feedback.

Switched-Capacitor Circuit Design

1x1.5 hours

This talk will cover switched-capacitor circuit design. Topics include discrete-time/z-transform, sample-and-hold, SC-integrator, biquad filters, 1/f noise reduction, non-ideal effects.

Oversampled Data Converters

1x1.5 hours

An introduction to oversampled data converters in discrete-time. Topics include noise shaping, stability of higher order modulators, modulator architectures, multi-bit vs single bit, a third-order design example.

Bandpass Delta-Sigma ADCs

1x1.5 hours

This talk will discuss the design of Bandpass Delta Sigma ADCs which are useful in RF systems. Topics covered include resonator structures, architecture choices and example systems.

Incremental ADCs and Sensor ADCs

1x1.5 hours

This talk will discuss the design of incremental ADCs as well as low-frequency sensor data converters. These goal of these converters are to not only have high linearity and SNR but also to have low offset and high accuracy.

Circuit Noise Limitations

1x1.5 hours

This talk will discuss noise in basic circuits and opamps as well as a simple switched-C integrator. Topics covered include device noise basics, amplifier/cascode/mirror/diff-pair noise, switched-C noise, oversampling and differential vs single-ended.



Course Programme

Monday, 24th June 2019

- 08:30-09:00 Registration & Welcoming
- 09:00-10:30 Lecture #1 - **OpAmp Stability and Optimization**
- 10:30-11:00 Coffee Break
- 11:00-12:30 Lecture #2 - **Low-Power OpAmp Design and Biasing (Part I)**
- 12:30-13:30 Lunch Break
- 13:30-14:00 [Guest Lecture \(To be Confirmed\)](#)
- 14:00-15:30 Lecture #3 - **Low-Power OpAmp Design and Biasing (Part II)**
- 15:30 -16:00 Coffee Break
- 16:00-17:30 Lecture #4 - **Switched-Capacitor Circuit Design**

Tuesday, 25th June 2019

- 09:00-10:30 Lecture #5 - **Oversampled Data Converters**
- 10:30-11:00 Coffee Break
- 11:00-12:30 Lecture #6 - **Bandpass Delta-Sigma ADCs**
- 12:30-13:30 Lunch Break
- 13:30-14:00 [Guest Lecture \(To Be Confirmed\)](#)
- 14:00-15:30 Lecture #7 - **Incremental ADCs and Sensor ADCs**
- 15:30 -16:00 Coffee Break
- 16:00-17:30 Lecture #8 - **Circuit Noise Limitations**



UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH



Prof. David A. Johns

David A. Johns - Received the B.A.Sc., M.A.Sc., and Ph.D. degrees from the University of Toronto, Toronto, ON, Canada, in 1980, 1983, and 1989, respectively. In 1988, he joined the University of Toronto, where he is currently a Full Professor. He has ongoing research programs in the general area of analog integrated circuits. Together with academic experience, he also has spent a number of years in the semiconductor industry and was a Co-Founder of a successful IP company called Snowbush Microelectronics, Toronto. He has co-authored over 80 publications including a successful graduate level textbook entitled "Analog Integrated Circuit Design". Dr. Johns is an IEEE Fellow and was a recipient of the 1999 IEEE Darlington Award. He was a Guest Editor of the IEEE JOURNAL OF SOLID-STATE CIRCUITS and an Associate Editor of the IEEE TRANSACTION ON CIRCUITS AND SYSTEMS.

