SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: https://cde.nus.edu.sg/ece

Area: Integrated Circuits & Embedded Systems (ICES)

Host: Dr Karim Ali

TOPIC	:	**An Ultra-Low-Power Current-Mode Continuous-Time Delta-Sigma Modulator for Always-On Biomedical Sensing**
SPEAKER	:	**Ms Ma Yuyu** **Graduate Student, ECE Dept, NUS**
DATE	:	**Friday, 30 October 2026**
TIME	:	**11:00AM-12:00PM**
VENUE	:	**Join Zoom Meeting** **https://nus-sg.zoom.us/j/85633583982?pwd=bEaGHWd0L7DVKNCQ1EzKe9o20K0QbG.1** **Meeting ID: 856 3358 3982** **Passcode: 005947**

ABSTRACT

Always-on biomedical sensing enables continuous monitoring of physiological signals for wearable healthcare and long-term health monitoring applications. Since these systems often operate under limited energy budgets, minimizing power consumption is essential for extending battery lifetime and enabling energy-autonomous operation. As fundamental building blocks of analog front-ends, amplifiers play a critical role in determining the overall power efficiency and signal accuracy. However, reducing amplifier bias currents to the picoampere range introduces significant challenges in maintaining sufficient gain, bandwidth, and linearity. Therefore, developing ultra-low-power amplifiers with improved linearity is essential for energy-efficient always-on biomedical sensing systems.

This work investigates the integration of pW-level amplifiers into a current-mode continuous-time ΔΣ modulator (CTDSM) for fA–pA biomedical current sensing. The proposed architecture supports two operating modes to accommodate different power and bandwidth requirements. Ultra-low-power circuit techniques are developed to improve amplifier linearity and system-level energy efficiency. A prototype fabricated in 180-nm CMOS technology demonstrates nanowatt-level power consumption and low-frequency current-sensing capability.

BIOGRAPHY

Ma Yuyu is a graduate student in the Department of Electrical and Computer Engineering at the National University of Singapore (NUS), where her research focuses on ultra-low-power analog and mixed-signal integrated circuits, and biomedical sensor interfaces.