

Course Topics

EEE 598: Low Power Bioelectronics

Prerequisites

EEE433 or equivalent and EEE523 or equivalent required. Familiarity with Cadence, knowledge of transistor basics and basic analog circuit blocks (current mirrors, diff pairs, amplifiers, etc.) also expected. *Alternatively, students with a background in basic neuroscience and recording techniques are highly encouraged to enroll, please contact the instructor.*

Course Description

We will begin with fundamental theory and techniques for low power analog circuit design especially subthreshold CMOS and BJT circuits (e.g. translinear circuits). We then move to biomedical applications and bio-inspired systems focused upon neuromorphic circuits. We will touch on concepts such as wireless challenges for implants, energy harvesting and electrochemistry. Students will have the opportunity to have their final projects fabricated in a commercial CMOS process!

Course Topics

- 1 Course Introduction/What does biology tell us?
- 2 BJTs, MOS in subthreshold, solid state physics
- 3 Translinear Circuits, Current-Mode Design
- 4 Basic Neuroscience
- 5 Information Capacity and the Blowfly Photoreceptor
- 6 Address Event Representation
- 7 Central Pattern Generators
- 8 Neural Amplifiers
- 9 Neural Interface and Wireless Communication
- 10 Cochlear Implants
- 11 Vestibular System
- 12 Body Sensor Networks
- 13 Energy Harvesting
- 14 Patch Clamp to Potentiostat
- 15 Live Demonstrations
- 16 Final Project Presentations