**Course Topics**

**EEE 521: 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