Electrophysiology and Bioelectricity of Tissues

Description
The goal of this class is to provide an intermediate level overview of electrophysiology and bioelectricity at the tissue level to graduate students with special interest in cardiology and neurosciences. We will develop the central electrical mechanisms from sets of coupled cells to the intact organ, building on those mechanisms that are common to many electrically active cells in the body. We will provide insights into the structural basis of electrical conduction in tissue. The approach will be a combination of qualitative explanations, quantitative analysis, and mathematical simulation. The class format will include didactic lectures, group discussion of primary literature, quantitative problem-solving exercises, writing assignments, and laboratory experiences.

The prerequisite for the course are Bioengineering 6000, 6003 or equivalent or permission of the instructor and knowledge of university undergraduate level calculus and physics.

Assignments will require the use of Matlab and other software. All course materials will be available through the University of Utah Canvas software and the class will communicate using this software.

Learning Objectives
To provide students with
- fundamental knowledge of tissue electrophysiology and bioelectricity
- understanding of approaches for computational modeling of conduction
- basic insights into conduction disturbance, in particular, cardiac arrhythmia

Essentials
Class times: Tuesday and Thursday, 10:45-12:05
Classroom: Old Conference Room, CVRTI

Instructors
Chris Butson (chris.butson@utah.edu)
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Schedule
See Canvas

Optional Literature
Computational Cardiology, Sachse, Springer
Bioelectricity: A Quantitative Approach, Plonsey and Barr, Springer

Grading
45% Lab reports (3x 15%)
20% Homework (2x 10%)
35% Midterm and Final Exam (2x 17.5%)