

In The Name Of GOD

Course: Bioelectromagnetics

Field: Biomedical Engineering (PhD)

Credit: 3

Topics:

- Review on Vector Analysis and Engineering Mathematics
- Electromagnetics Theory (Electric Fields- Magnetic Fields- Maxwell's Equations- Material's Properties)
- Bioelectric Potentials and Fields
- Ionic Channels- Action Potentials- H-H model
- Impulse Propagation– Cable Equation
- Extra-cellular Fields-Clamp Techniques
- Volume source-Volume conductor Models
- Interaction of EM field with Tissue
- Electric Stimulation (Neural tissue, Heart)
- Magnetic Stimulation (Neural tissue, Heart)
- Electrical Measurements (Neural activity, Heart Activity, Muscle, Eye- EEG,ECG,EMG,ERG)
- Magnetic Measurements (Neural activity, Heart Activity, Muscle, Eye-MEG,MCG,MMG,MRG)
- Intrinsic Properties' Measurements (Electrical, Magnetic)
- Electrical Impedance Tomography
- Magnetic Resonance Imaging
- Biological Magnetic Materials
- Clinical Applications (Magnetotherapy, Magnetic plethysmography, non-invasive Deep Brain Stimulation)
- Computational Modelling for EM wave Interaction Analysis

References:

- Bioelectricity A Quantitative Approach: *Plonsey, Barr*
- Bioelectromagnetism - Principles and Applications of Bioelectric and Biomagnetic Fields: *Malmivuo, Plonsey*, Oxford University Press.
- Advances in Electromagnetic Fields in Living Systems: *Lin*, Springer
- Bioelectromagnetic Medicine: *Rosch, Markov*, Informa Healthcare
- Bioimpedance and Bioelectricity Basics: *Grimnes, Martinsen*, Academic Press
- Computational electromagnetics with MATLAB: *Sadiku*, CRC Press
- Field and Wave Electromagnetics: *David K. Cheng*, Addison-Wesley
- Principles and Applications of Electromagnetic Fields: *Plonsey*, McGraw Hill