Detailed course goals

The course goals are organized in thinking skills in six different levels from basic to higher order levels of thinking according to the Bloom taxonomy (1950s), modified by Anderson (1990s): Remembering, Understanding, Applying, Analyzing, Evaluating and Creating.

1. Main goals

- The generation and propagation of bioelectrical potentials in the normal case and in pathological cases.
- The processing of recorded bioelectrical signals. What is their diagnostic information? How can this contribute to the investigation of the patient and improve his/her treatment?

2. Thematic goals

The course gives knowledge and insights on the following topics.

Remembering, Understanding and Applying

- Explain how electrical potentials develop at the cell membrane and how they are conducted, especially in nerve and muscle cells. Estimate parameters of the resting and action potentials. Understand an electrical and mathematical model of the membrane ion currents during an action potential. Understand and describe the anatomy and function of the nerves and muscles is such a detail that the different properties of the biopotentials can be explained in the normal case and in pathological cases.
- Describe evoked potentials (EP) and their pathological changes in for example multiple sclerosis, describe the method for averaging EP and determination of the conduction velocity in the nerves and the diagnostic value of these methods, show how averaging EP can improve the SNR.
- Describe the principle of muscular control and the changes of the electromyogram (EMG) for a peripheral nerve injury, a central injury, a myogenic injury and an impaired neuromuscular junction.
- Describe the electroencefalogram (EEG) and its changes with age, mental activity and different diseases and symptoms (epilepsy, metabolic disturbances, brain tumors).
- Describe the function of the cardiac muscle and the signal conduction system and the electrocardiogram (ECG) in normal state and in diseases and symptoms (conduction disturbances, ischemia, infarction, arrythmia).
- Describe methods for defibrillation and pacemakers.
- Describe which signal models and analysis methods that are applicable for different biosignals such as EEG, EMG, ECG.
- The use of time and frequency domain signal analysis methods applied to bioelectrical signals.
- Describe essential parameters of measurement systems for the analysis of EEG, EMG, and ECG.
Analyzing, Evaluating and Creating

- Design measurement systems for recording biological signals registered with macroelectrodes, with regard to the signal properties in the time and frequency domain and the suppression of noise.
- Design digital measurement systems for diagnostic purposes within the fields of clinical physiology and clinical neurophysiology.