# 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

### Remembering, Understanding and Applying

- Explain how electrical potentials develop at the cell membrane and how they are conducted, especially in nerve and muscle cells. Apply that for the estimating resting and action potentials.
- Understand electrical and mathematical models of the membrane ion currents in steady state and during an action potential and its propagation.
- 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 the electroencefalogram (EEG) and its changes with age, mental activity and different diseases and symptoms (epilepsy, metabolic disturbances, brain tumors).
- Describe evoked potentials (EP) and their pathological changes in for example multiple sclerosis.
- Describe how EP:s can be used for determination of the conduction velocity in the nerves and the diagnostic value of these methods.
- Show how methods for averaging EP can improve the SNR in EP signals.
- 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 principles of motor units and motor unit recruitment as well as the motor unit action potential (MUAP).
- Describe the function of the cardiac muscle and its signal conduction system.
- Describe how the signal propagation in the heart is linked to the electrocardiogram (ECG) in normal state and in diseases and symptoms (conduction disturbances, ischemia, infarction, and arrhythmia).
- Describe methods for defibrillation and pacemakers.
- Describe which signal models and analysis methods that are applicable for various bioelectrical signals such as EEG, EMG, and ECG.
- Apply time and frequency domain signal analysis methods to bioelectrical signals.

**Analyzing, Evaluating and Creating**

- Design measurement systems for recording bio-electrical signals, 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.