Course Package

Neural & Motor Systems

Name module	Neural & Motor Systems
Educational programme	MSc Biomedical Engineering
Period	First quartile of the second semester (Quarter 2A)
Study load	15 ECTS

Neural & Motor Systems			
Quarter 1A	**Quarter 1B**	**Quarter 2A**	**Quarter 2B**
		Human Movement Control (5 EC)	
		Biomedical Signal Acquisition (5 EC)	
		Capita Selecta BME (5 EC)	

Required preliminary knowledge: Completed BSc degree in Biomedical Engineering, Electrical Engineering, Physics / Applied physics or an equivalent of Technical Medicine. Knowledge of Dynamics and Control, Basics of Linear System Analysis, Basics of Linear Algebra, Familiarity with Matlab.

191150480 **Human Movement Control**
Different neuromuscular systems are involved in the control of human movement. These systems include the different sensory systems (visual, proprioceptive, vestibular), the central nervous system and the muscles. This course discusses the role of the separate systems and their interactions in motor control with an emphasis on integration of sensory information, postural control and control and adaptation of reaching movements. Obtained knowledge can be applied in the development of treatments and assessment methods for diagnosis in neurology and (neuro)rehabilitation. In this course student will obtain knowledge about the physiological and computational mechanisms involved in movement control through lectures and self-study and will learn to make use of engineering skills/tools in assignments and a practical to better understand the importance of the different involved processes.

191210720 **Biomedical Signal Acquisition**

The modules are tentative and subject to change. Please check the website regularly.

The electrochemical detection methods form a beautiful comprehensive part of this course: starting from electrochemical processes at an electrode and the subsequent mass transport phenomena result in the three basic operational principles (potentiometry, amperometry and conductometry). When the relation between the variable to be determined (ionic species and/or its concentration) and the measured quantity (voltage, current or conductance) is known, the relevant examples follow: the oxygen electrode (Clark electrode), the carbon dioxide sensor (Severinghaus princinciple) and the pH sensors (glass electrode). Additionally, other chemical biosensors like the glucose sensor, and biosensors based on optical detection principles are treated. The treatment of physical sensor systems is guided by the biomedical application: blood pressure and flow, lung volume and capacity. A bridge to the course Lab-on-a-Chip is formed by some examples of micro Total Analysis Systems, of which the detector is based on one of the mentioned sensor principles. This course is open for TM, MBE, APH, NANO and EE students. General knowledge from your bachelor programs is required. For TM students, this course bridges the gap between biophysiology and biomedical signal processing and -analysis. This course consists of 12 lectures, where you actively participate in discussions to reach the learning objectives.. You will write your critical review paper in teams of two students to train and improve your knowledge and understanding via the original papers you have to review. Moreover, a 4-hr practical project concerning synchronous sensor data retrieval into a computer is one of the instructional modes of this course.

2014002.. **Capita Selecta BME**

This course aims to provide the opportunity to explore a specific topic within the field of Biomedical Engineering in depth, which is not available as a regular course.
Selected Topics in Biomedical Engineering concern a specific assignment to investigate, explore or research a specific topic in the field of Biomedical Engineering. The assignment has to be concluded by a written report. The topic will be selected and tutored by a scientific staff member of the Membrane Technology group. The duration of the assignment is 140 hours.