

Course Package

Neural & Motor Systems

Name module	Neural & Motor Systems
Educational programme	MSc Biomedical Engineering
Period	Second quartile of the first semester (Quarter 1B)
Study load	15 ECTS

Neural & Motor Systems			
Quarter 1A	Quarter 1B	Quarter 2A	Quarter 2B
	Technology for Health (5 EC)		
	Robotics for Medical Applications (5 EC)		
	Electives 1/2:		
	Ergonomics (5 EC)		
	Biomechanics (5 EC)		

Required preliminary knowledge: Bachelor's degree in Biomedical Engineering, Industrial Design & Engineering, or Mechanical Engineering. Knowledge of Dynamics and Control (Master's level course within Mechanical Engineering) or a comparable course, Basic knowledge of Linear Algebra, Familiarity with MATLAB, Mechanics, Multi-body Kinematics and Dynamics, General Physics, General Mathematics, Principles of Signal Processing.

201500222 Technology for Health

The aim of Biomedical engineering is to provide technological solutions for health care problems, for example for the support of human functions which are impaired by trauma or disease. As a biomedical engineer, you will be actively involved in technology research for advancing new ideas, concepts or intermediate results on the translation chain towards innovation of clinical practice and commercial exploitation. The overall goal of this course is to provide an overview of key aspects of the process of biomedical engineering and the role of the biomedical engineer.

201300004 Robotics for Medical Applications

This course provides an introduction to robotics with emphasis on the mathematical tools for describing the kinematics and control of robotic manipulators. In addition, selected topics concerning modeling of soft biological tissues and haptics, are also discussed. In minimally invasive surgery, instruments should be manipulated and navigated remotely. Principles from robotics are used to describe this manipulation and

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navigation mathematically. The result of the operation should be observed and fed back to a surgeon. Although often the image of a video camera is sufficient, sometimes tactile information is needed about the mechanical properties of the tissue. There are haptic interfaces developed, which gives the surgeon 'the feeling' of the tissue remotely'. The technical background required for this, is being handled and applied in a lab.

Elective (select 1 out of 2):

- [201400287](#) **Ergonomics**

During 5 or 6 lectures in quartile 1B the students will familiarise themselves with a typical workplace assessment method, focusing on the physical aspects of the human-machine interface. In these first weeks, the student will have to start searching for a suitable work place to analyse. Subsequently, they will work in groups to analyse and improve an existing workplace. Preferably the analysis will be finished towards the end of quartile 1B. During the re-design of the workplace, performed in quartile 2A, it will be inevitable to use knowledge acquired in previous (mechanics, anatomy, design) courses. The adaptation of the workplace can be aimed at a general group of employees, or it can be aimed at a specific employee.

- [191150390](#) **Biomechanics**

The Biomechanics course applies subjects and techniques from mechanics to biological structures. These are in general characterized by strong non-linear and time-dependent behavior (e.g. growth). Among the subjects are the remodeling behavior of bone, viscous-elastic properties of soft tissue, dynamics of biological fluids, lung mechanics and the mechanics of human movement, applied to gait, flight and scaling rules. The students will be informed about common techniques to tackle these areas.