Module Description, available in: EN

Biomedical Engineering

General Information

Number of ECTS Credits

3

Module code

TSM_BioMedEng

Valid for academic year

2024-25

Last modification

2019-08-31

Coordinator of the module

Marcel Egli (HSLU, marcel.egli@hslu.ch)

Explanations regarding the language definitions for each location:

- Instruction is given in the language defined below for each location/each time the module is held.
- Documentation is available in the languages defined below. Where documents are in several languages, the percentage distribution is shown (100% = all the documentation).
- The examination is available 100% in the languages shown for each location/each time it is held.

	Lausanne			Lugano	Zurich		
Instruction					**X** E 100%		
Documentation					**X** E 100%		
Examination					**X** E 100%		

Module Category

TSM Technical scientific module

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

Basic knowledge in cell biology, anatomy, functional anatomy, and pathology (fracture, neuro, orthopedics, osteosynthesis) is beneficial. Potentially missing knowledge can be acquired individually as an autodidact effort.

Brief course description of module objectives and content

The lecture encompasses a comprehensive exposition of Biomedical Engineering. It commences with a historical overview, followed by an examination of contemporary methodologies and tools. Physiological principles will be discussed before focusing on subjects like biosignals and sensors. An array of topics will be dissected, including but not limited to bioimaging, biomolecular engineering, tissue engineering, and the intricacies of precision and personalized medicine. Attendees will attain discernment concerning foundational prerequisites such as biology and physiology and the variety of materials used for implants, prostheses, and available biomaterials. Current clinical paradigms will be scrutinized, notably osteoporosis, fracture fixation, and osteoarthritis. Furthermore, orthopedic treatment modalities and osteosynthesis techniques will be meticulously analyzed,

encompassing fracture fixation and the primary stability of implants and joint replacements. A deeper comprehension will be given to measurement technologies catering to human physiological performance encompassing kinematics and kinetics. This includes evaluating movement analysis, muscular dynamics, and cerebral activity. (7) The course will also discuss (robot-assistive) rehabilitation technologies in the case of neuropathology, such as stroke, MS, and paraplegia, with a specific focus on innovations in virtual/augmented reality.

Aims, content, methods

Learning objectives and competencies to be acquired

The first half of each afternoon session will focus on biomedical engineering and prosthetics. During the second half, the students will be tasked to work as a group on describing a medical device product of their choice (an existing device or a medical aid they would like to build).

Module content with weighting of different components

Biomedical engineering

- Physiological systems
- Biotechnology and tissue engineering
- Bioelectric and neuro-engineering
- Human sensory systems
- Bioreactors and tissue engineering in regenerative medicine

Prosthetics

- Human movement analysis, orthopedics, biomechanics, biomaterials
- Biomechanical testing of implants/test development & lab accreditation

Robot assistive rehabilitation

- Clinical assessment of neurodegenerative diseases/human performance analysis
- Rehabilitation devices and procedures
- Therapeutic procedures based on virtual/augmented reality

Teaching and learning methods

Various teaching methods, like classical teaching group work, will be applied.

Literature

Slides and lecture notes will be made available to the students. Furthermore, a list will be provided with books and articles relevant to the topics taught.

Assessment

Certification requirements

Module does not use certification requirements

Basic principle for exams

As a rule, all standard final exams are conducted in written form. For resit exams, lecturers will communicate the exam format (written/oral) together with the exam schedule.

Standard final exam for a module and written resit exam

Kind of exam

Written exam

Duration of exam

120 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

Handwritten cheat sheet (two A4 pages only)

Other permissible aids

No other aids permitted

Special case: Resit exam as oral exam

Kind of exam

Oral exam

Duration of exam

30 minutes

Permissible aids

No aids permitted