Biomedical Engineering

Lecturer: Khazankin Grigoriy
Semester: 1-3 **Duration**: 18+18+18 weeks
Workload (h): 216 **Presence** (h + CH): 96 (12) **Self-Study** (h): 108
Contents: Biomedical engineering is a broad field covering a vast array of disciplines. The most obvious and traditional areas of focus support the medical equipment and devices used by physicians and healthcare personnel. These "macro" endeavors are now being complemented by the "micro"-level focus made possible by breakthroughs in chemical engineering and nanotechnologies. At the same time, advanced information, sensor and wireless technologies are opening up new means for monitoring patients and interpreting patient health data.
Background and relations to other courses: nothing.
Main topics and learning objectives:

Themes	Learning objectives
Bioinformatics & Computational Biology	To know basic definitions for the areas of research 1) Computational biomodeling 2) Computational genetics 3) Computational neuroscience
Biosensors	To know Examples and applications, Placement of biosensors: In-vivo, In-vitro, At-line, In line, Point-of-concern. A biosensor is any piece of hardware that interacts with a biological or physiological system to acquire a signal for either diagnostic or therapeutic purposes. Data gathered using biosensors are then processed using biomedical signal processing techniques as a first step toward facilitating human or automated interpretation.
Biomedical Signal Processing	To know ways to process biomedical signals using a variety of mathematical formulae and algorithms. Working with traditional bio-measurement tools, the signals can be computed by software to provide physicians with real-time data and greater insights to aid in clinical assessments. By using more sophisticated means to analyze what our bodies are saying, we can potentially determine the state of a patient's health through more noninvasive measures.
Biomedical Imaging & Image Processing	To know about analysis, enhancement and display of images captured via x-ray, ultrasound, MRI, nuclear medicine and optical imaging technologies. How to reconstruct and model the image which allow instant processing of 2D signals to create 3D images.
Health Informatics, Telemedicine	To know how to using mathematical models, we will be able to see trends over the course of a person's life, which allowing personalized medicine. To know communication technologies for relevant applications and their integration as well as the adaptation and transformation of operating rooms and other medical settings.

Assessment:
Summative:

Number and Type; Connection to Course	Duration	Part of final mark in %
Pass Test each semester	90 min	60%

Learning outcomes:
Academic: To be able to state problems and solve tasks in biomedical engineering using Big Data technologies.
Prerequisites for Credit Points: The credit points will be granted when the course has been successfully completed, i.e. all parts of the examination are passed.