Biomechanics, BMEN05

Syllabus

The aim of the course is to widen the conceptions of mechanics to also include biological systems.

Learning outcomes

Knowledge and understanding

For a passing grade the student must:
- be familiar with the different organ systems of the human body and how they work together
- understand how systems of joints, e.g. the hip and the knee, works in mechanical sense
- understand how human locomotion can be modelled and analysed in using mechanical concepts
- understand how the building stones of the human body (bone, cartilage, tendons, ligaments and muscles) can be described in mechanical terms
- be able to describe the prerequisites prosthesis and implants must fulfill in order to work mechanically in the human body

Competences and skills

For a passing grade the student must:
- be able to formulate and solve problems in biomechanics, both in statics and dynamics
- be able to make use of techniques in optimization to solve a problem in biomechanics
- be able to model human motions using commercial software

Judgement and approach

For a passing grade the student must:
- be able to estimate properties in strength of materials such as safety factor and mechanical lifetime of biological tissues
- be able to describe the quality of human motions
- be able to interpret and discuss information from literature in medicine

Contents

The architecture of the skeleton and the apparatus of locomotion are described as a mechanical system where the bones are coupled together in joints and the activity in the muscles control the movements. The human body is built up by different elements such as bone, articular cartilage, ligaments, tendons, muscles, blood and body fluids. These elements are described and modelled in the context described in earlier courses in mechanics and solid mechanics. Newton´s equations are applied on the different parts of the skeleton and concepts like constitutive equations are applied to biological material e.g. bone, where effects from mechanical loading on the inner structure are modelled.