Engineering Mechanics (Reg. No. 2016)

Type of position Full PhD study: 48 months		**Main supervisor** Lanie Gutierrez-Farewik
KTH School SCI		**Co-supervisor(s)** Ruoli Wang
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Specific subject area(s)
Biomechanics, human movement mechanics, exoskeleton design, human strength augmentation

Title of project
Design, simulation, control and sensors in active exoskeletons and assistive devices for patients with motor disorders

Number of available positions
1-2

Earliest start date
1 September 2020

Project website
https://www.kth.se/en/sci/kth-moveability-lab

Short description of the project
KTH MoveAbility Lab, at the Department of Engineering Mechanics, is offering a PhD student position in Biomechanics, with a focus on assistive devices that augment motion in patients with motor disorders. People with disabilities are the largest minority group in the world. Despite this, we as scientists have relatively little ability to prevent the long-term downward spiral which occurs when their primary disability causes secondary consequences on the body. This PhD project aims to design and develop robotic assistive devices for the lower extremities that complement one's physical function and give one the opportunity to locomote and perform daily activities optimally according to one's abilities. These can be comprised of hard materials, with or without a combination with soft, compliant materials. The doctoral student shall, through simulation-based design and prototyping, develop devices that sense and provide assistance-as-needed that complements the user's own abilities, within a closed loop that includes the user's biosignals. The devices should take advantage of users' inherent capabilities, yet still reduce the users' metabolic energy demands and increase their ability to perform daily activities.The project focus could include any or all of the following methodologies, among others: detection and identification of motion intention using wearable biosensors, recognition of motion phases, simulation-based biomechanical modelling of the person-device system, hybrid device control which balances inputs based on the user's muscle activation signals with automatic control, intrinsic or extrinsic device control, human-in-the-loop optimization. Specific methods can include simulation, motion prediction using biomechanical modelling, motion prediction using machine learning algorithms, prototyping, and experimentation on human subjects. The project will be partially financed through the Promobilia Foundation. The target group includes individuals with physical disabilities due to pathology, injury or age.